





TEST REPORT

<p>Eurofins KCTL Co.,Ltd. 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-5008-1021 FAX: 82-505-299-8311 www.kctl.co.kr</p>	<p>Report No.: KR23-SRF0173-B Page (1) of (133)</p>	 KCTL
<p>1. Client</p> <ul style="list-style-type: none"> ◦ Name : Samsung Electronics Co., Ltd. ◦ Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea ◦ Date of Receipt : 2023-03-14 <p>2. Use of Report : Certification</p> <p>3. Name of Product / Model : Notebook PC / NP935QNA</p> <p>4. Manufacturer / Country of Origin : Samsung Electronics Co., Ltd. / Vietnam</p> <p>5. FCC ID : A3LNP935QNA</p> <p>6. Date of Test : 2023-04-15 to 2023-05-25</p> <p>7. Location of Test : <input checked="" type="checkbox"/> Permanent Testing Lab <input type="checkbox"/> On Site Testing (Address:65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea)</p> <p>8. Test method used : FCC Part 15 Subpart C, 15.247</p> <p>9. Test Result : Refer to the test result in the test report</p>		
Affirmation	<p>Tested by</p> <p>Name : Sunghyun Yoon (Signature) </p>	<p>Technical Manager</p> <p>Name : Seungyong Kim (Signature) </p>
<p style="text-align: right;">2023-06-05</p> <p style="text-align: center;">Eurofins KCTL Co.,Ltd.</p> <p>As a test result of the sample which was submitted from the client, this report does not guarantee the whole product quality. This test report should not be used and copied without a written agreement by Eurofins KCTL Co.,Ltd.</p>		

REPORT REVISION HISTORY

Date	Revision	Page No
2023-05-26	Originally issued	-
2023-06-01	Updated	4,9,54
2023-06-05	Updated	9

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Note. The report No. KR23-SRF0173-A is superseded by the report No. KR23-SRF0173-B.

General remarks for test reports

Statement concerning the uncertainty of the measurement systems used for the tests

(may be required by the product standard or client)

Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:

Procedure number, issue date and title:

Calculations leading to the reported values are on file with the testing laboratory that conducted the testing.

Statement not required by the standard or client used for type testing

CONTENTS

1.	General information	4
2.	Device information	4
2.1.	Frequency/channel operations.....	5
2.2.	Duty Cycle Factor	6
3.	Antenna requirement	8
3.1	Antenna information.....	8
3.2	Directional Gain Calculations.....	8
4.	Summary of tests.....	9
5.	Measurement uncertainty	10
6.	Measurement results explanation example	11
7.	Test results	12
7.1.	Maximum peak output power.....	12
7.2.	Peak Power Spectral Density	17
7.3.	6 dB Bandwidth(DTS Channel Bandwidth) & 99% Bandwidth.....	29
7.4.	Spurious Emission, Band Edge and Restricted bands.....	51
7.5.	Conducted Spurious Emission.....	112
7.6.	AC Conducted emission	131
8.	Measurement equipment.....	133

1. General information

Client : Samsung Electronics Co., Ltd.
Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
Manufacturer : Samsung Electronics Co., Ltd.
Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
Factory : SAMSUNG ELECTRONICS VIETNAM CO.,LTD.
Address : Khu Cong nghiep Ten Phong 1, Yen Trung, Yen Phong, Bac Ninh, Vietnam
Laboratory : Eurofins KCTL Co.,Ltd.
Address : 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
Accreditations : FCC Site Designation No: KR0040, FCC Site Registration No: 687132
VCCI Registration No. : R-20080, G-20078, C-20059, T-20056
CAB Identifier: KR0040
ISED Number: 8035A
KOLAS No.: KT231

2. Device information

Equipment under test : Notebook PC
Model : NP935QNA
Modulation technique : WIFI(802.11a/b/g/n/ac/ax) : DSSS, OFDM, OFDMA
Number of channels : 13 ch (20 MHz)
Power source : DC 11.58 V
Antenna specification : Antenna 1 (Aux) : PIFA Antenna
Antenna 2 (Main) : PIFA Antenna
Antenna gain : Antenna 1 (Aux) : 1.07 dBi
Antenna 2 (Main) : -1.05 dBi
Frequency range : 2 412 MHz ~ 2 472 MHz (802.11b/g/n/ax_HT20/HE20)
Software version : NP930QNA.001
Hardware version : REV0.1
Test device serial No. : Conducted : KQZZ930W300149P
Radiated : KQZZ930W300364Z
Operation temperature : 10 °C ~ 35 °C

2.1. Frequency/channel operations

This device contains the following capabilities:

WLAN (11a/b/g/n/ac/ax), Bluetooth (BDR/EDR/BLE)

Ch.	Frequency (MHz)
01	2 412
.	.
06	2 437
.	.
11	2 462
12	2 467
13	2 472

Table 2.1.1. 802.11b/g/n HT20 mode



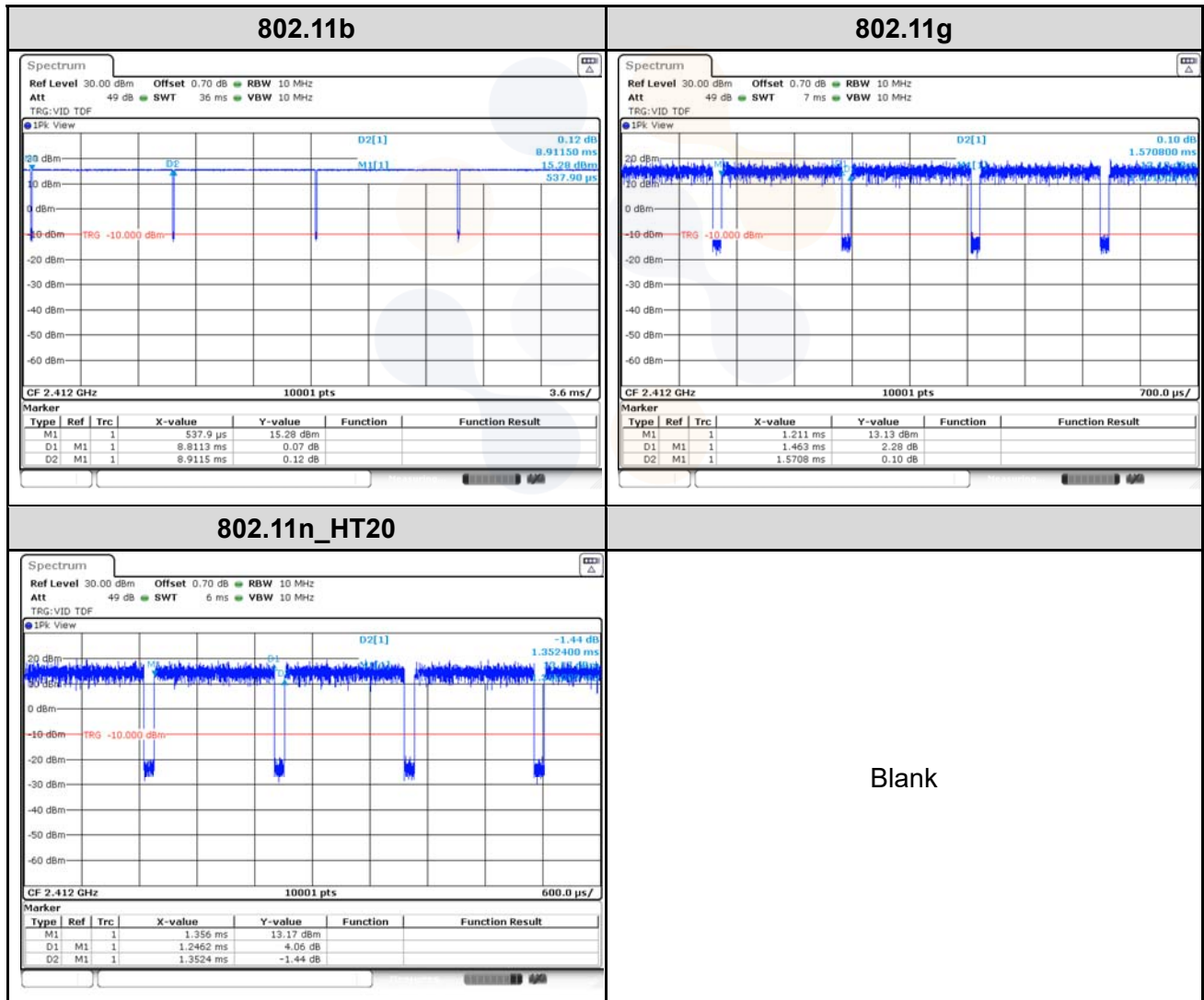
2.2. Duty Cycle Factor

SISO

Test mode	Period (ms)	On time (ms)	Duty cycle		Duty Cycle Factor (dB)
			(Linear)	(%)	
802.11b	8.912	8.811	0.988 7	98.87	0.05
802.11g	1.571	1.463	0.931 3	93.13	0.31
802.11n_HT20	1.352	1.246	0.921 6	92.16	0.35

Notes.

1. Duty cycle (Linear) = Ton time / Period
2. DCF(Duty cycle factor) = $10\log(1/\text{duty cycle})$
3. DCF is not compensated to Average result if duty cycle is more than 98%

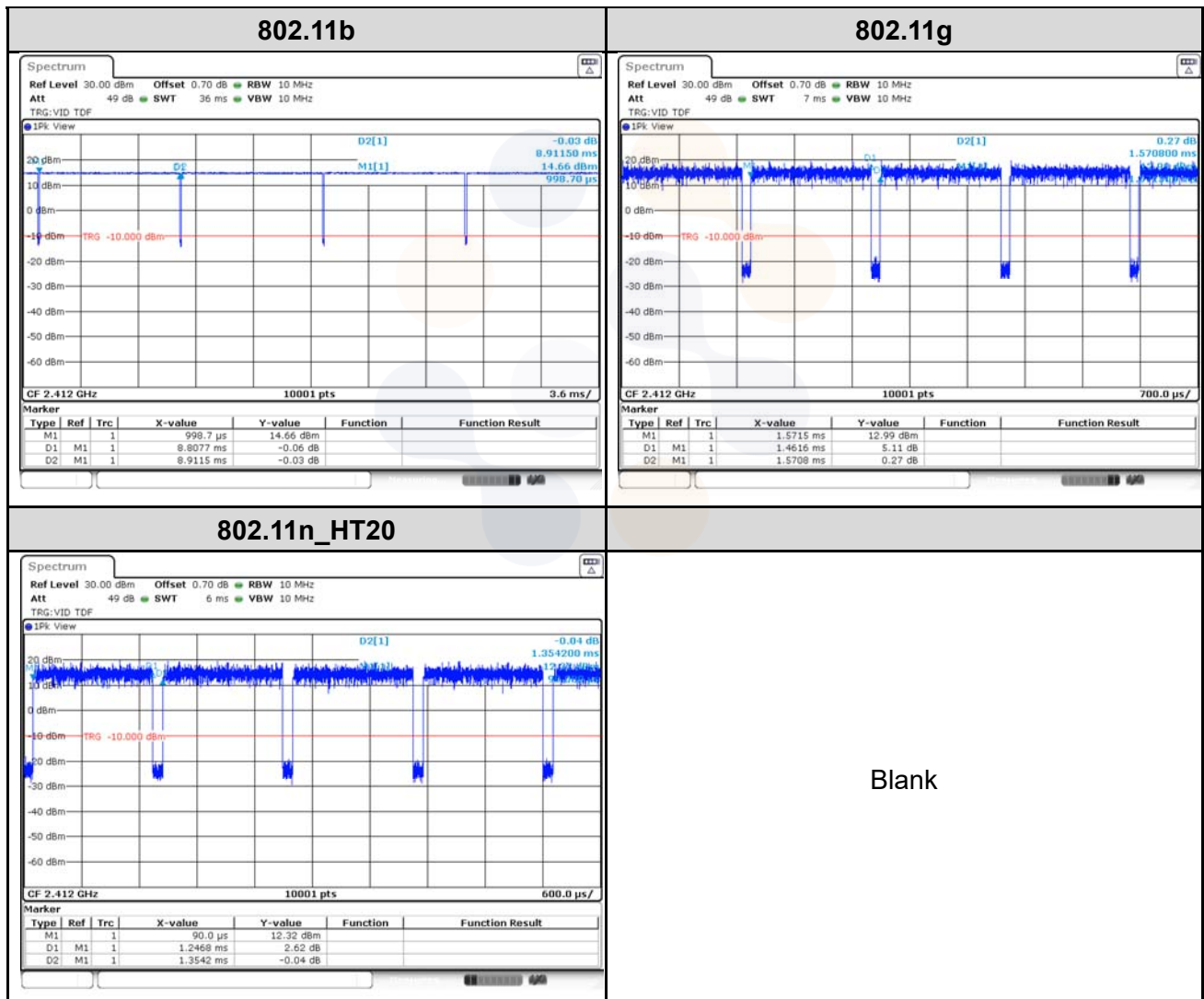


MIMO

Test mode	Period (ms)	On time (ms)	Duty cycle		Duty Cycle Factor (dB)
			(Linear)	(%)	
802.11b	8.912	8.808	0.988 3	98.83	0.05
802.11g	1.571	1.462	0.930 6	93.06	0.31
802.11n_HT20	1.354	1.247	0.921 0	92.10	0.36

Notes.

1. Duty cycle (Linear) = Ton time / Period
2. DCF(Duty cycle factor) = $10\log(1/\text{duty cycle})$
3. DCF is not compensated to Average result if duty cycle is more than 98%



3. Antenna requirement

Requirement of FCC part section 15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

- The transmitter has permanently attached PIFA Antenna (Internal antenna) on board.
- The E.U.T Complies with the requirement of §15.203, §15.247.

3.1 Antenna information

Mode	SISO		CDD	MIMO
	ANT 1	ANT 2	ANT 1 + 2	ANT 1 + 2
802.11b	√	X	√	√
802.11g	√	X	√	√
802.11n HT20	√	X	√	√

√ = Support, X = Not support

3.2 Directional Gain Calculations

According to clause F), 2), d), (i) of KDB 662911 D01 Multiple Transmitter Output, Directional gain may be calculated by using the formulas as below.

3.2.1. Directional Antenna Gain

ANT 1 Gain (dBi)	ANT 2 Gain (dBi)	Combined Gain (dBi)
1.07	-1.05	3.08

Note.

Unequal antenna gains, with equal transmit powers. For antenna gains given by G_1, G_2, \dots, G_N dBi
 Directional gain = $10 \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N_{ANT}]$ dB i

Sample calculation

Directional gain = $10 \log[(10^{1.07/20} + 10^{-1.05/20})^2 / 2] = 3.08$ dB i

4. Summary of tests

FCC Part section(s)	Parameter	Test Condition	Test results
15.247(b)(3)	Maximum peak output power	Conducted	Pass
15.247(e)	Peak power spectral density		Pass
15.247(a)(2)	6 dB channel bandwidth		Pass
15.207(a)	AC Conducted Emissions		Pass
15.247(d)	Conducted Spurious Emissions		Pass
15.205(a), 15.209(a)	Spurious emission	Radiated	Pass
	Band-edge, restricted band		Pass

Notes:

- All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- According to exploratory test no any obvious emission were detected from 9 kHz to 30 MHz. Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30 m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.
- All the radiated tests have been performed two modes (Notebook and Tablet mode) and the fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z.
Worst case: Notebook mode, X axis
- All configurations have been performed (stand-alone, stand-alone with TA, with accessories) and the worst case is Stand-alone with TA.
- The test procedure(s) in this report were performed in accordance as following.
 - ANSI C63.10-2013
 - KDB 558074 D01 V05r02
 - KDB 662911 D01 v02r01
- The worst-case data rate were:
 - 802.11b mode: 1Mbps
 - 802.11g mode: 6Mbps
 - 802.11n_HT20 mode: MCS0

5. Measurement uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

All measurement uncertainty values are shown with a coverage factor of $k=2$ to indicated a 95 % level of confidence. The measurement data shown herein meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded uncertainty (\pm)	
Conducted RF power	0.9 dB	
Conducted spurious emissions	1.3 dB	
Radiated spurious emissions	Below 30 MHz:	2.3 dB
	30 MHz ~ 1 000 MHz	2.5 dB
	1 000 MHz ~ 18 000 MHz	4.7 dB
	Above 18 000 MHz	4.8 dB
Conducted emissions	9 kHz ~ 150 kHz	2.7 dB
	150 kHz ~ 30 MHz	2.7 dB

6. Measurement results explanation example

The offset level is set in the spectrum analyzer to compensate the RF cable loss factor between EUT conducted output port and spectrum analyzer.

With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

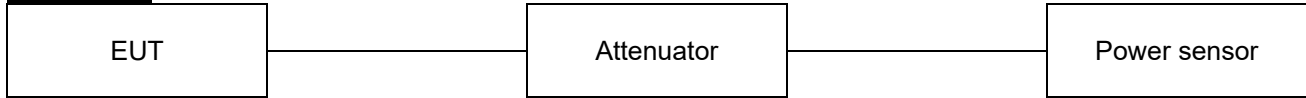
Frequency (MHz)	Factor(dB)	Frequency (MHz)	Factor(dB)
30	9.79	9 000	11.84
50	10.09	10 000	11.85
100	10.37	11 000	11.91
200	10.43	12 000	12.31
300	10.51	13 000	12.67
400	10.58	14 000	12.34
500	10.80	15 000	12.02
600	10.89	16 000	13.80
700	10.91	17 000	12.36
800	10.93	18 000	13.74
900	10.94	19 000	13.41
1 000	10.93	20 000	13.37
2 000	11.59	21 000	13.38
3 000	11.87	22 000	13.04
4 000	12.10	23 000	13.00
5 000	12.55	24 000	12.83
6 000	12.84	25 000	12.87
7 000	11.11	26 000	13.47
8 000	11.30	26 500	12.85

Note: Offset(dB) = RF cable loss(dB) + Attenuator(dB)

7. Test results

7.1. Maximum peak output power

Test setup



Limit


According to §15.247(b)(3), For systems using digital modulation in the 902-928 MHz, 2 400-2 483.5 MHz, and 5 725-5 850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

According to §15.247(b)(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Test procedure

ANSI C63.10 - Section 11.9

Used test method is section 11.9.1.3 and 11.9.2.3.1

<p style="text-align: center;">Eurofins KCTL Co.,Ltd. 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-5008-1021 FAX: 82-505-299-8311 www.kctl.co.kr</p>	<p style="text-align: center;">Report No.: KR23-SRF0173-B Page (13) of (133)</p>	
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Test settings

General

Section 15.247 permits the maximum conducted (average) output power to be measured as an alternative to the maximum peak conducted output power for demonstrating compliance to the limit. When this option is exercised, the measured power is to be referenced to the OBW rather than the DTS bandwidth (see ANSI C63.10 for measurement guidance).

When using a spectrum analyzer or EMI receiver to perform these measurements, it shall be capable of utilizing a number of measurement points in each sweep that is greater than or equal to twice the span/RBW to set a bin-to-bin spacing of $\leq RBW/2$ so that narrowband signals are not lost between frequency bins.

If possible, configure or modify the operation of the EUT so that it transmits continuously at its maximum power control level. The intent is to test at 100 % duty cycle; however a small reduction in duty cycle (to no lower than 98 %) is permitted, if required by the EUT for amplitude control purposes. Manufacturers are expected to provide software to the test lab to permit such continuous operation.

If continuous transmission (or at least 98 % duty cycle) cannot be achieved due to hardware limitations (e.g., overheating), the EUT shall be operated at its maximum power control level, with the transmit duration as long as possible, and the duty cycle as high as possible during which sweep triggering/signal gating techniques may be used to perform the measurement over the transmission duration.

11.9.1. Maximum peak conducted output power

One of the following procedures may be used to determine the maximum peak conducted output power of a DTS EUT.


11.9.1.1. RBW \geq DTS bandwidth

The following procedure shall be used when an instrument with a resolution bandwidth that is greater than the DTS bandwidth is available to perform the measurement:

- a) Set the RBW \geq DTS bandwidth.
- b) Set VBW $\geq [3 \times RBW]$.
- c) Set span $\geq [3 \times RBW]$.
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.

11.9.1.3. PKPM1 Peak power meter method

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall use a fast-responding diode detector.

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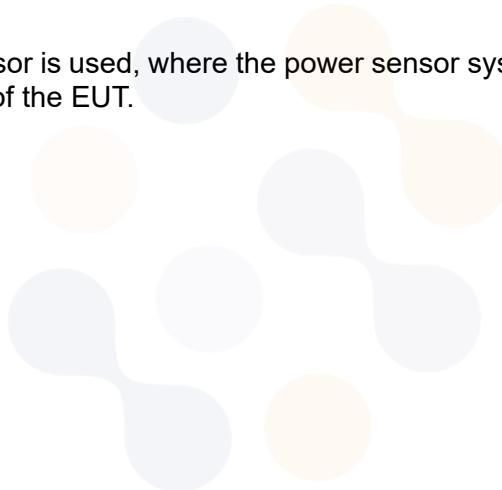
11.9.2.3.1. Measurement using a power meter (PM)

Method AVGPM is a measurement using an RF average power meter, as follows:

- a) As an alternative to spectrum analyzer or EMI receiver measurements, measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied:
 - 1) The EUT is configured to transmit continuously, or to transmit with a constant duty cycle.
 - 2) At all times when the EUT is transmitting, it shall be transmitting at its maximum power control level.
 - 3) The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.
- b) If the transmitter does not transmit continuously, measure the duty cycle, D, of the transmitter output signal as described in 11.6.
- c) Measure the average power of the transmitter. This measurement is an average over both the ON and OFF periods of the transmitter.
- d) Adjust the measurement in dBm by adding $[10 \log(1/D)]$, where D is the duty cycle

Notes:

A peak responding power sensor is used, where the power sensor system video bandwidth is greater than the occupied bandwidth of the EUT.



Test results

**SISO
 Conducted Output Power**

Test mode	Frequency (MHz)	Measured output power				Limit (dBm)
		Reading (dBm)		DCF (dB)	Result (dBm)	
		Peak	Average		Average	
802.11b	2 412	21.48	18.76	-	18.76	30
	2 437	21.71	19.01		19.01	
	2 462	21.76	19.12		19.12	
	2 467	4.65	1.89		1.89	
	2 472	2.18	-0.68		-0.68	
802.11g	2 412	26.47	17.54	0.31	17.85	
	2 437	26.63	17.70		18.01	
	2 462	26.27	17.80		18.11	
	2 467	10.06	1.06		1.37	
	2 472	7.63	-1.50		-1.19	
802.11n HT20	2 412	26.38	17.41	0.35	17.76	
	2 437	26.59	17.67		18.02	
	2 462	26.31	17.84		18.19	
	2 467	10.25	1.32		1.67	
	2 472	7.79	-1.29		-0.94	

Notes:

1. Average result(dB m) = Average Reading (dB m) + DCF(dB)

MIMO
Conducted Output Power

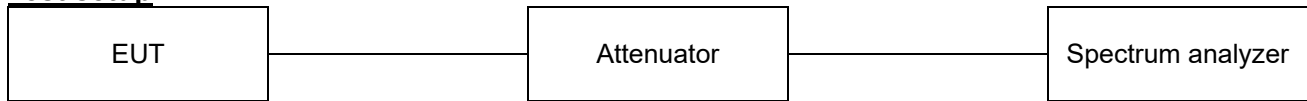
Test mode	Frequency (MHz)	Measured output power							Limit (dBm)
		Reading (dBm)				DCF (dB)	Result (dBm)		
		Peak		Average			Peak	Average	
		ANT 1	ANT 2	ANT 1	ANT 2		ANT1 + ANT2	ANT1 + ANT2	
802.11b	2 412	20.93	20.35	18.21	17.65	-	23.66	20.95	30
	2 437	21.63	20.77	18.89	18.03		24.23	21.49	
	2 462	21.29	20.31	18.57	17.66		23.84	21.15	
	2 467	4.69	5.22	1.92	2.45		7.97	5.20	
	2 472	2.22	2.35	-0.68	-0.54		5.30	2.40	
802.11g	2 412	26.42	26.02	17.49	17.05	0.31	29.23	20.60	
	2 437	26.67	26.26	17.78	17.31		29.48	20.87	
	2 462	26.33	25.84	17.88	16.95		29.10	20.76	
	2 467	10.24	10.89	1.37	2.02		13.59	5.03	
	2 472	7.72	8.04	-1.40	-1.14		10.89	2.05	
802.11n HT20	2 412	26.24	25.94	17.37	17.04	0.36	29.10	20.58	
	2 437	26.43	26.40	17.55	17.42		29.43	20.86	
	2 462	26.16	25.71	17.74	17.03		28.95	20.77	
	2 467	10.66	11.23	1.63	2.31		13.96	5.35	
	2 472	7.92	8.27	-1.18	-0.76		11.11	2.41	

Notes:

1. Result(dB m) = 10log(10^(ANT1/10)+10^(ANT2/10)) (dB m)

7.2. Peak Power Spectral Density

Test setup



Limit

According to §15.247(e), for digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

Test procedure

ANSI C63.10 - Section 11.10.2

Test settings

Method PKPSD (peak PSD)

The following procedure shall be used if maximum peak conducted output power was used to determine compliance, and it is optional if the maximum conducted (average) output power was used to determine compliance:

- 1) Set analyzer center frequency to DTS channel center frequency.
- 2) Set the span to 1.5 times the DTS bandwidth.
- 3) Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- 4) Set the VBW $\geq 3 \times \text{RBW}$.
- 5) Detector = peak.
- 6) Sweep time = auto couple.
- 7) Trace mode = max hold.
- 8) Allow trace to fully stabilize.
- 9) Use the peak marker function to determine the maximum amplitude level within the RBW.
- 10) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

Test results

SISO

Test mode	Frequency (MHz)	Result (dBm/ 3kHz)	Limit (dBm/ 3kHz)
		ANT 1	
802.11b	2 412	-3.45	8.00
	2 437	-3.11	
	2 462	-3.07	
	2 467	-20.30	
	2 472	-21.32	
802.11g	2 412	-9.79	
	2 437	-8.09	
	2 462	-7.90	
	2 467	-23.97	
	2 472	-26.52	
802.11n HT20	2 412	-8.80	
	2 437	-8.67	
	2 462	-8.48	
	2 467	-22.45	
	2 472	-25.72	

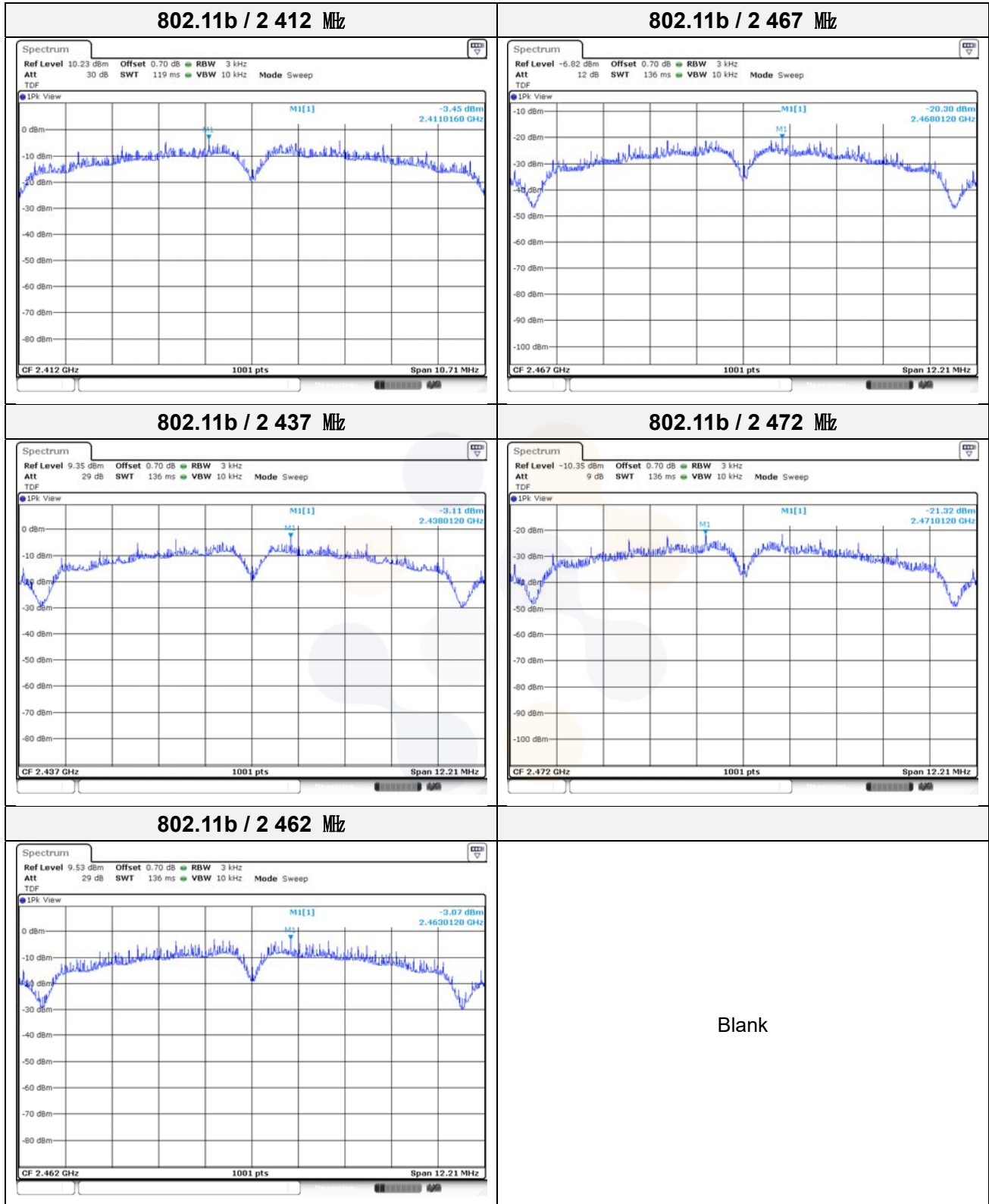
MIMO

Test mode	Frequency (MHz)	Reading (dBm/ 3kHz)		Result (dBm/ 3kHz)	Limit (dBm/ 3kHz)
		ANT 1	ANT 2		
802.11b	2 412	-4.50	-4.75	-1.61	8.00
	2 437	-3.17	-3.83	-0.48	
	2 462	-3.66	-4.75	-1.16	
	2 467	-19.97	-19.20	-16.56	
	2 472	-22.67	-22.35	-19.50	
802.11g	2 412	-8.89	-8.36	-5.61	
	2 437	-8.58	-8.11	-5.33	
	2 462	-8.93	-8.87	-5.89	
	2 467	-23.14	-23.41	-20.26	
	2 472	-27.45	-26.30	-23.83	
802.11n HT20	2 412	-9.33	-8.95	-6.13	
	2 437	-8.91	-8.72	-5.80	
	2 462	-9.11	-9.20	-6.14	
	2 467	-23.16	-22.95	-20.04	
	2 472	-26.64	-25.08	-22.78	

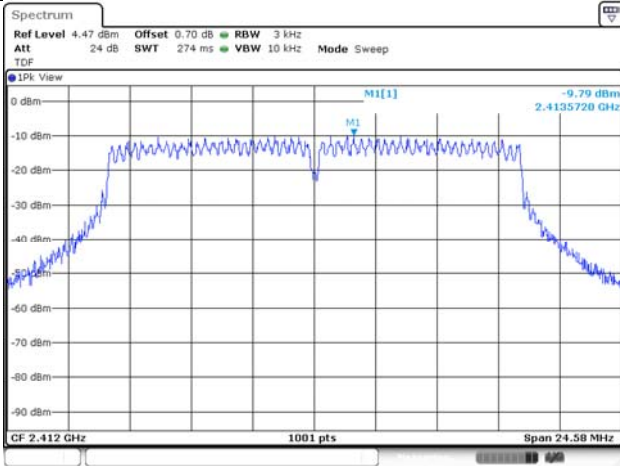
Notes:

1. Result(dB m) = $10\log(10^{(Ant1/10)}+10^{(ant2/10)})$ (dB m)

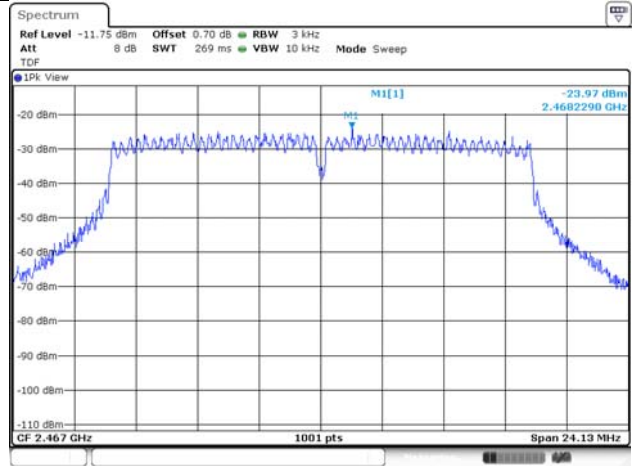
SISO



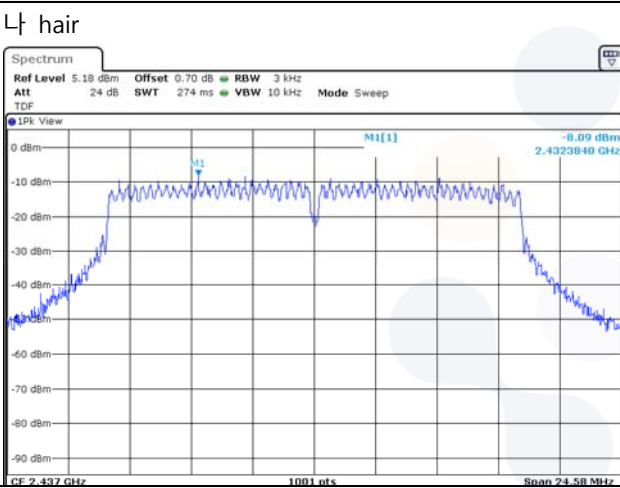
802.11g / 2 412 MHz



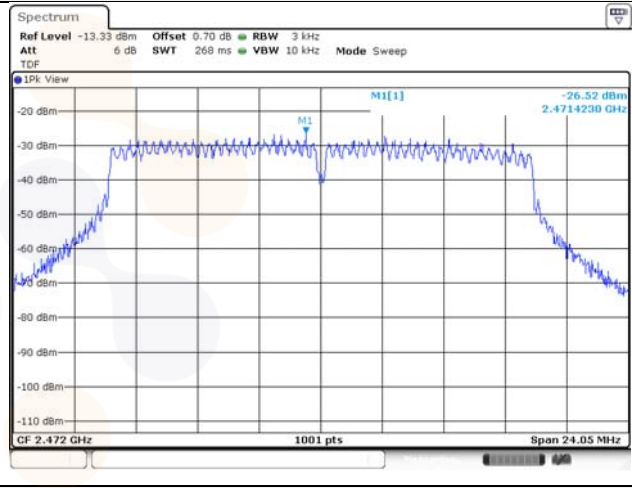
802.11g / 2 467 MHz



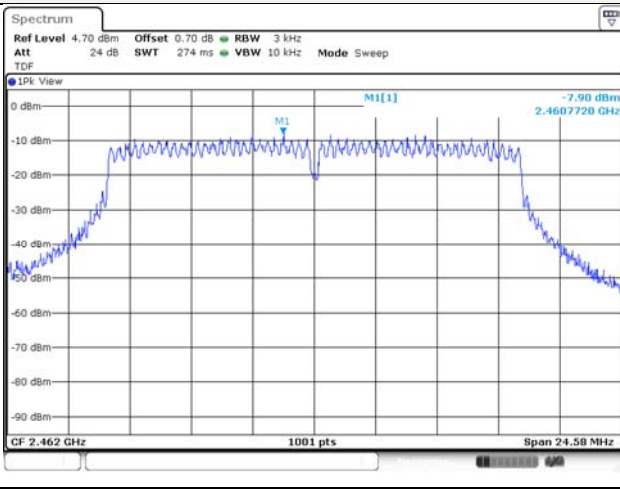
802.11g / 2 437 MHz



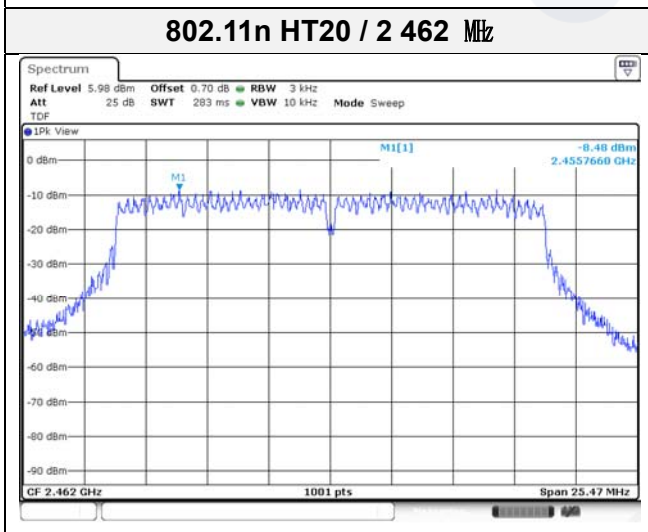
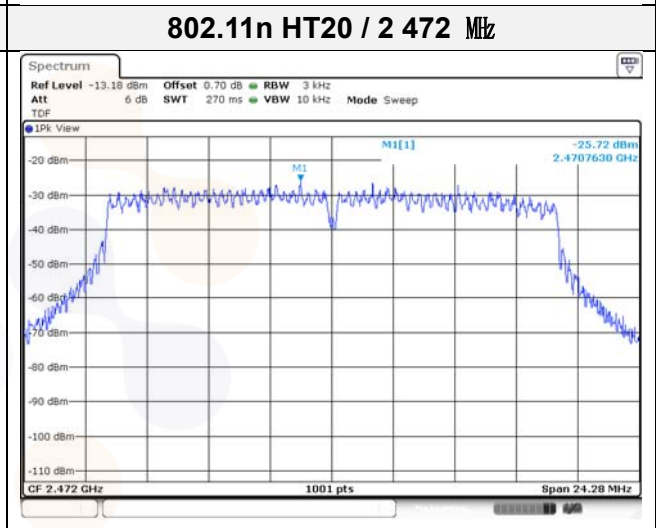
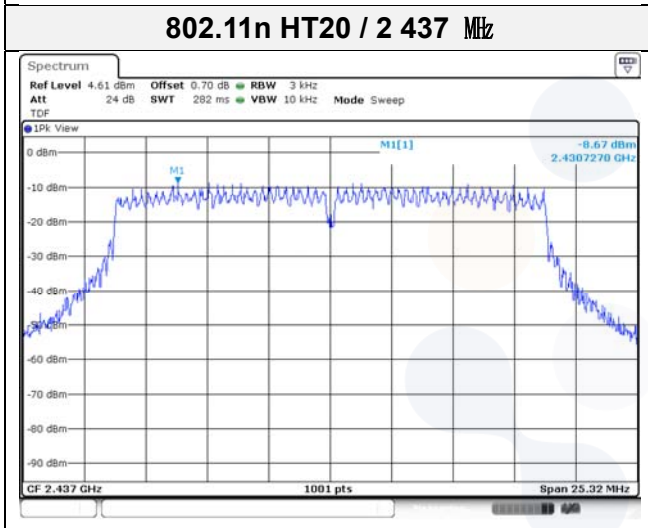
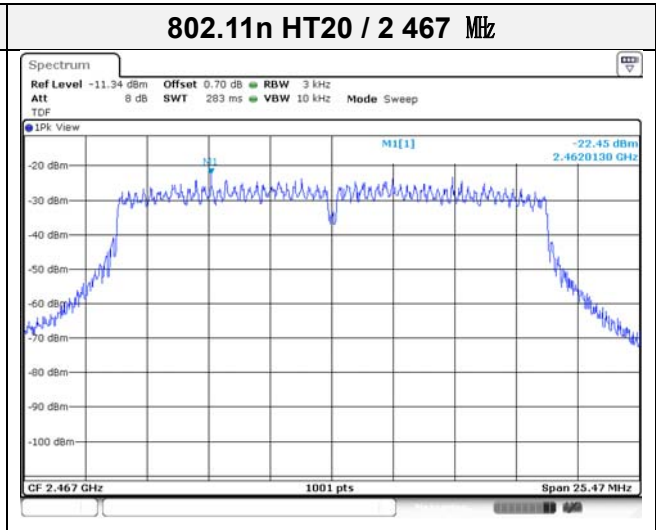
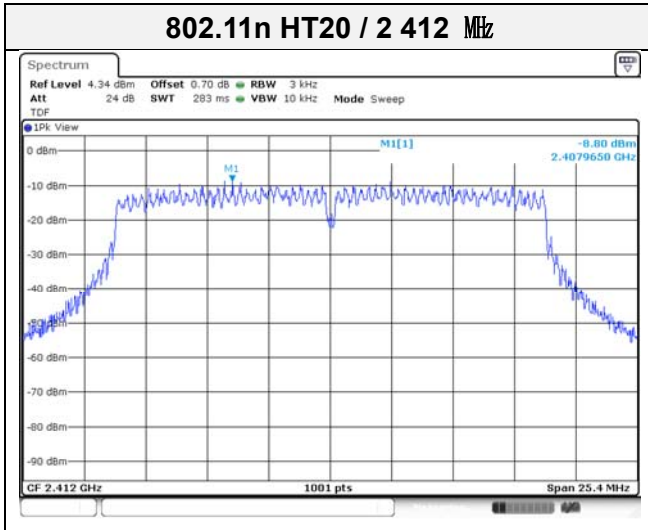
802.11g / 2 472 MHz



802.11g / 2 462 MHz

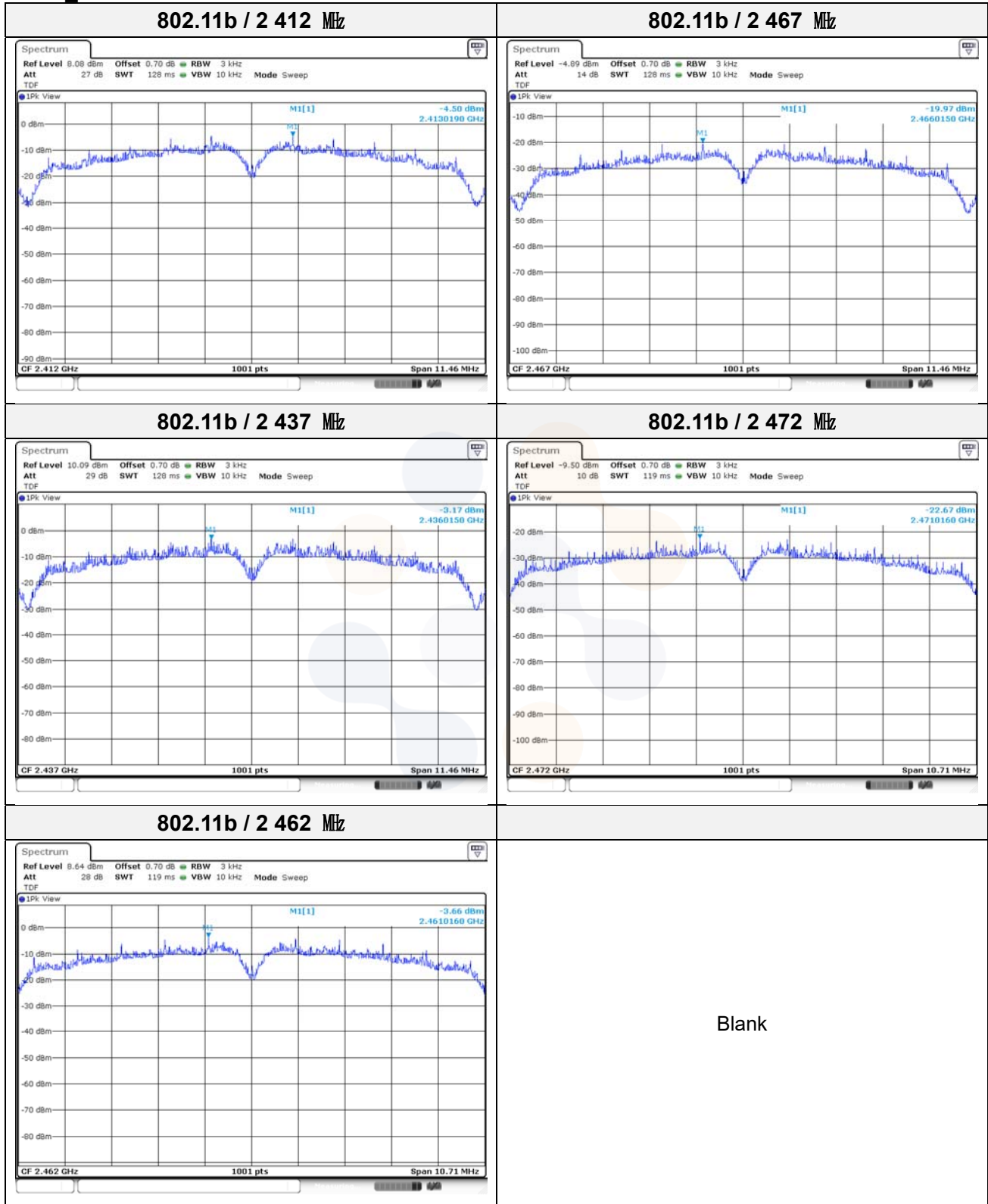


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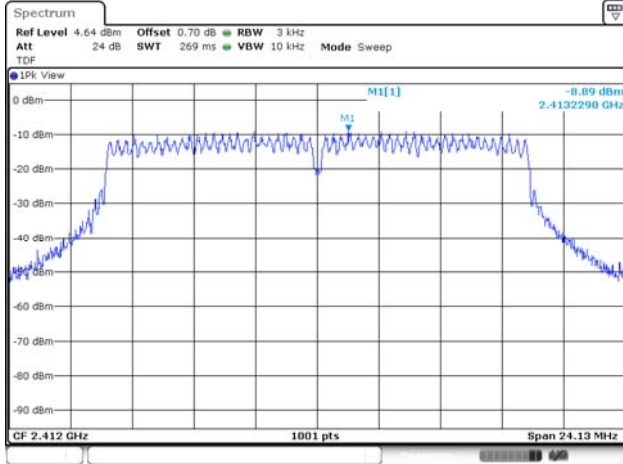


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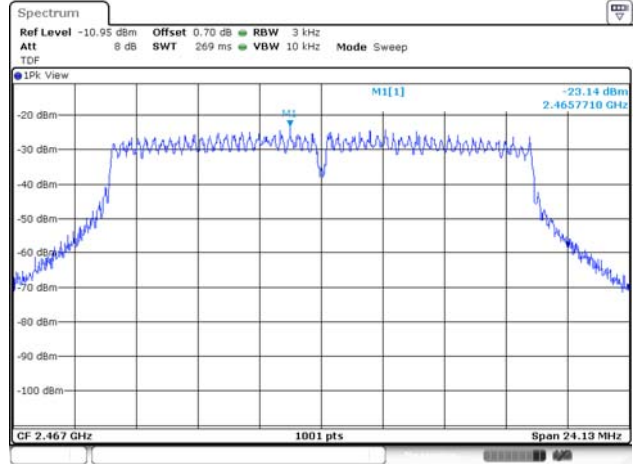
MIMO_ANT 1



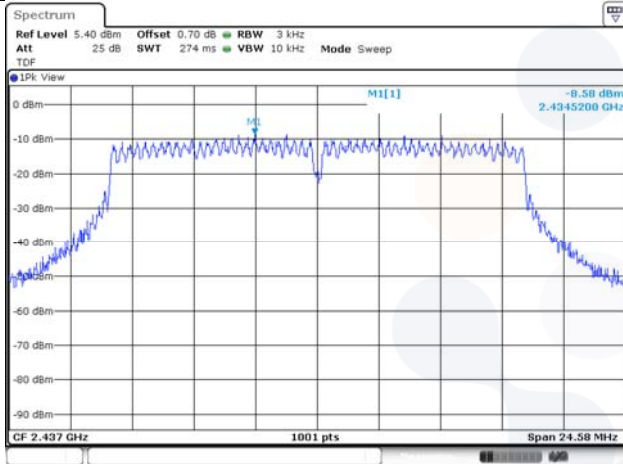
802.11g / 2 412 MHz



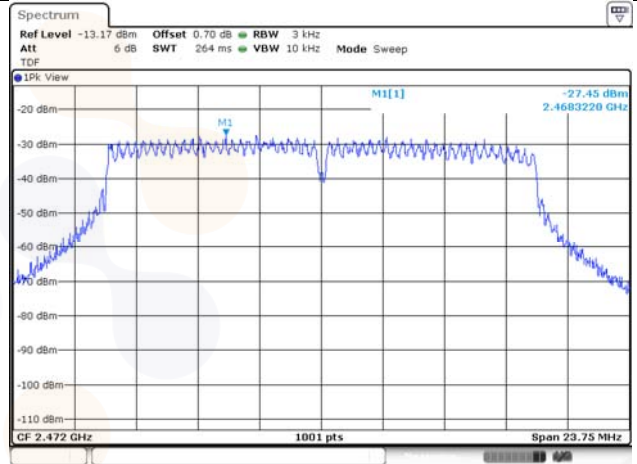
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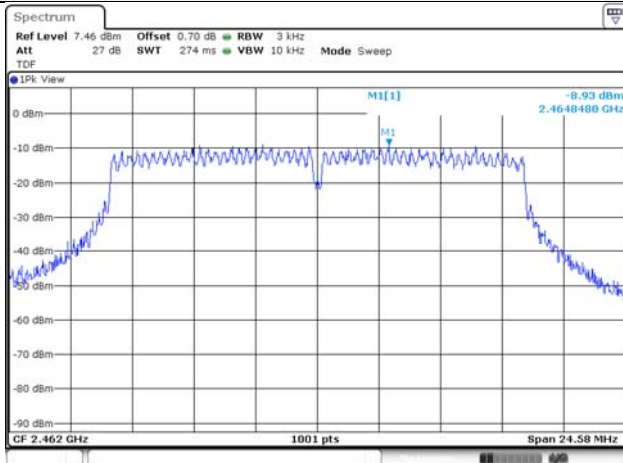
802.11g / 2 437 MHz



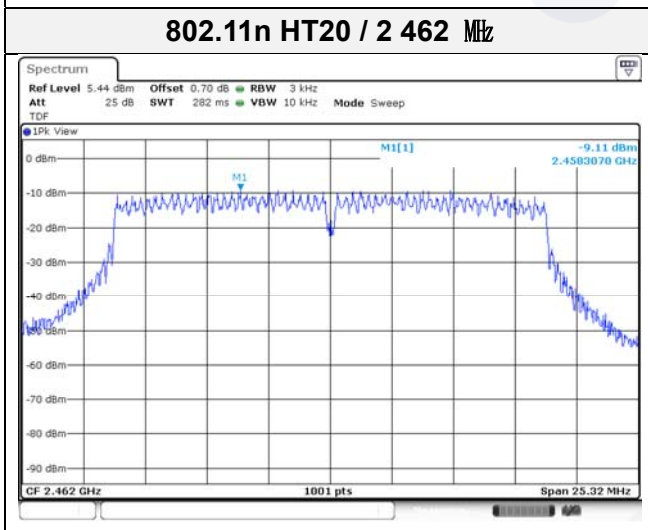
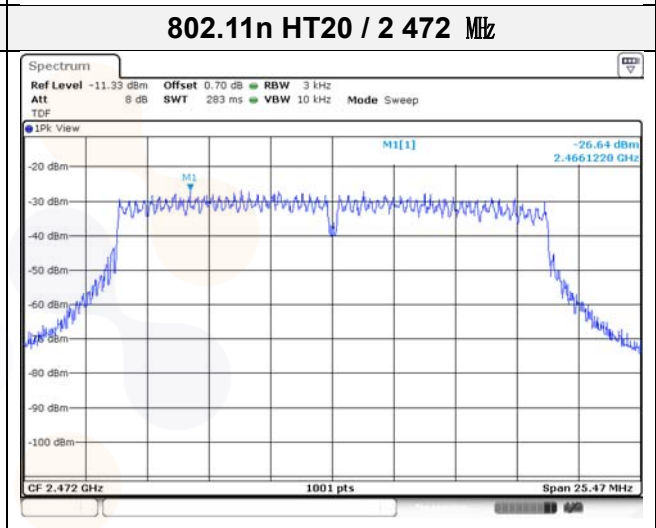
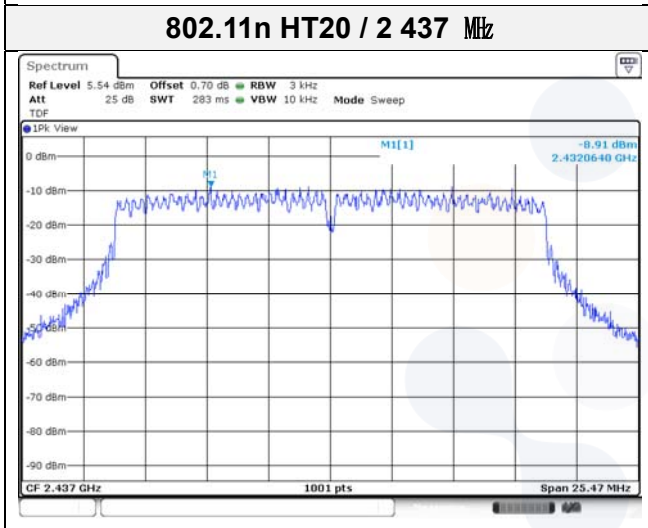
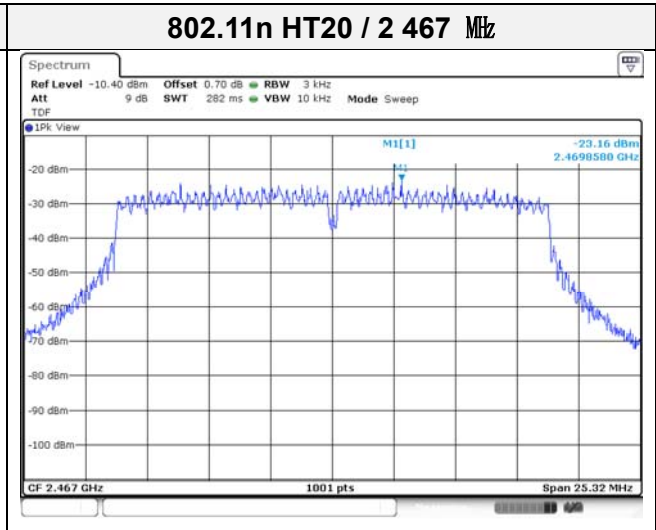
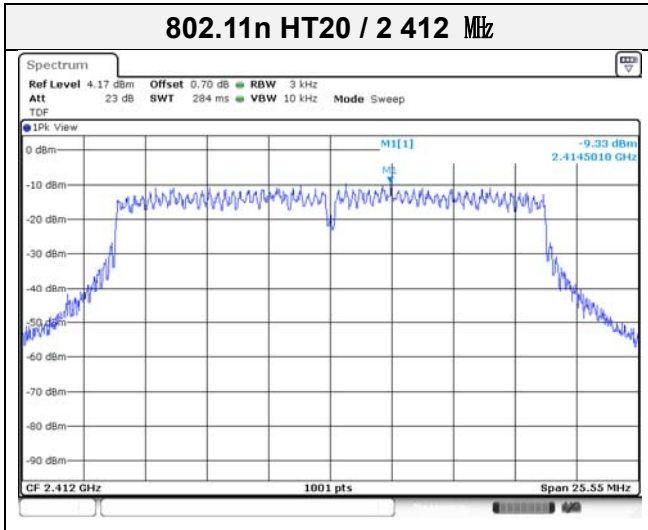
802.11g / 2 472 MHz



802.11g / 2 462 MHz

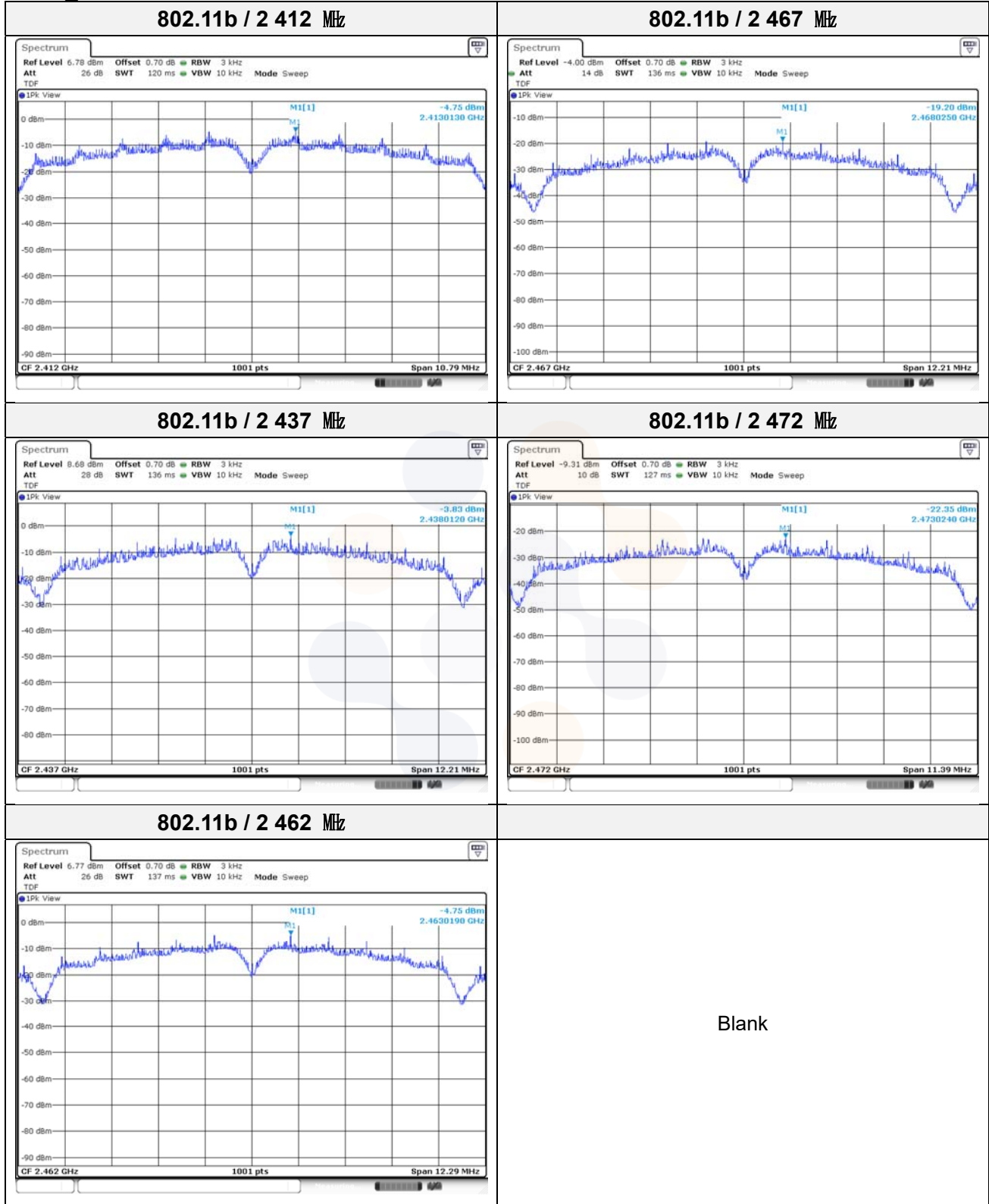


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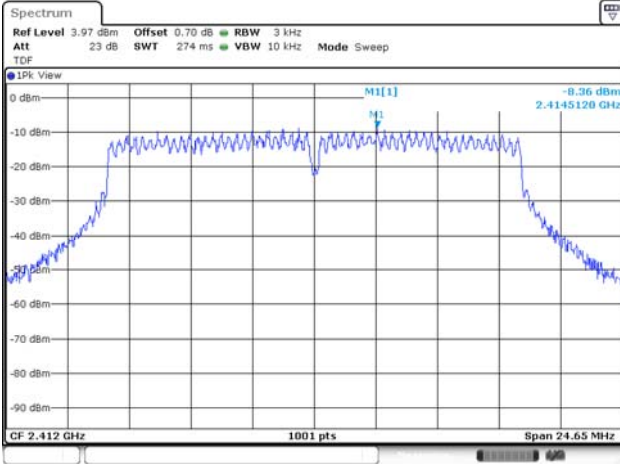


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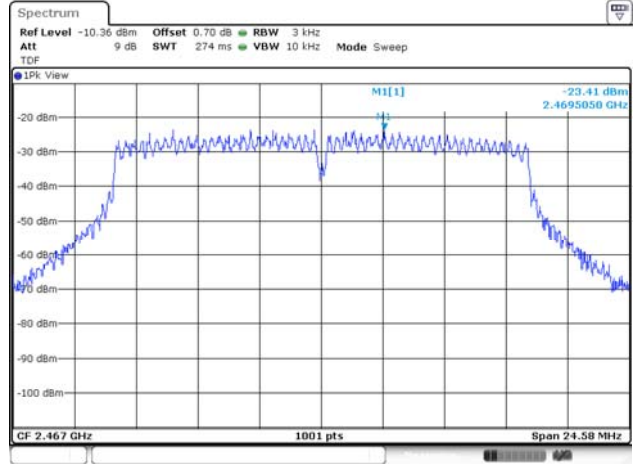
MIMO_ANT 2



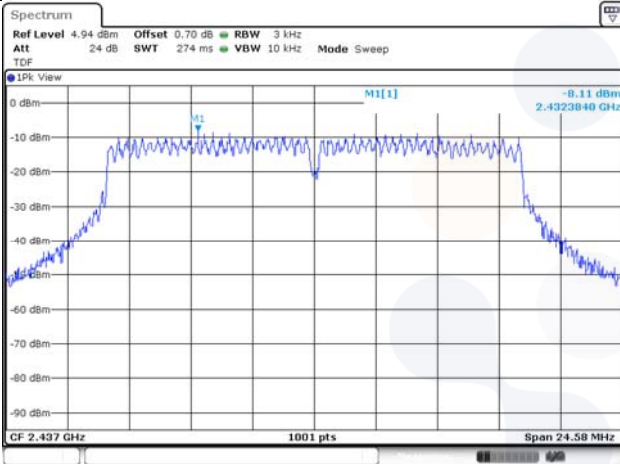
802.11g / 2 412 MHz



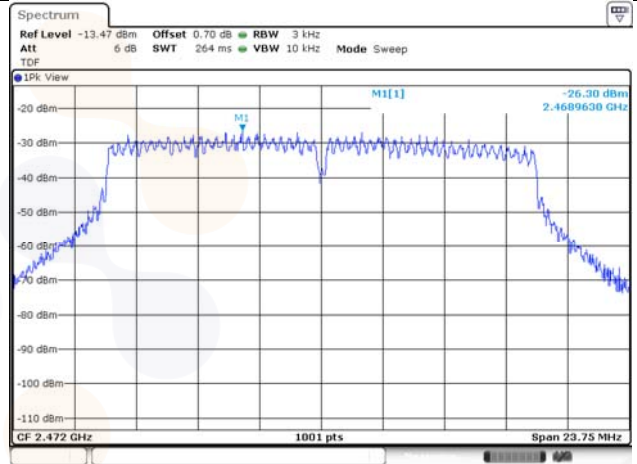
802.11g / 2 467 MHz



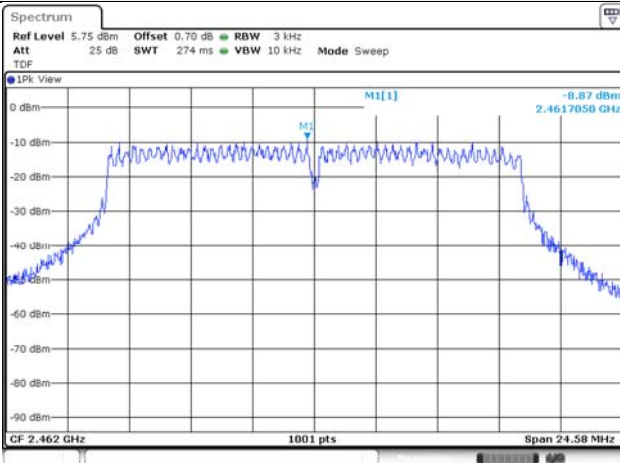
802.11g / 2 437 MHz



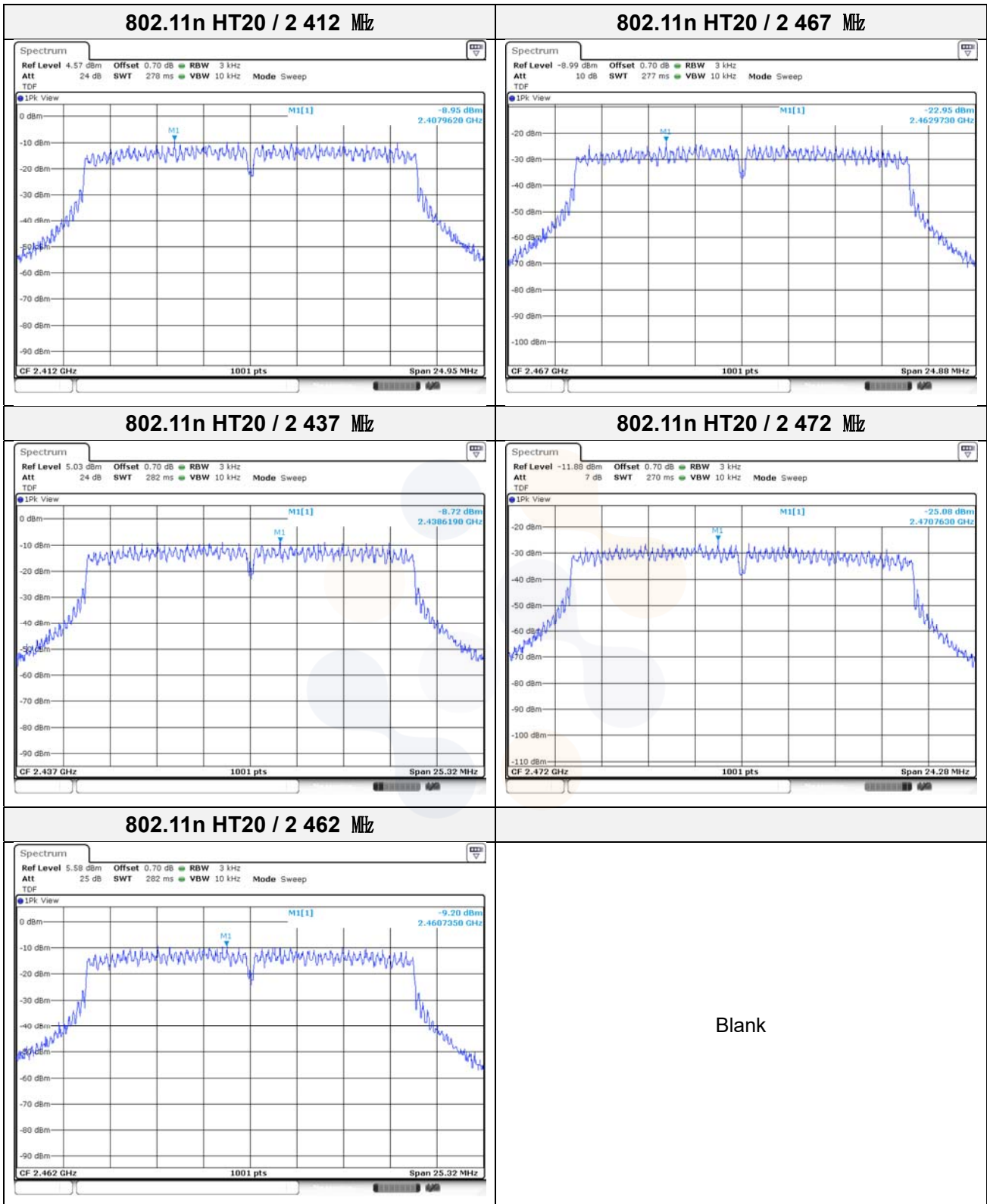
802.11g / 2 472 MHz



802.11g / 2 462 MHz

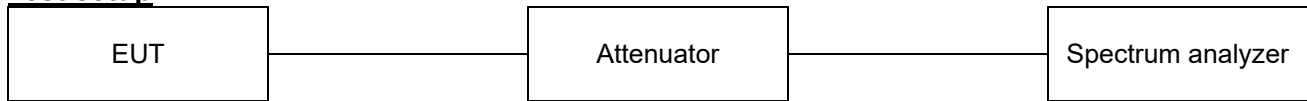


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7.3. 6 dB Bandwidth(DTS Channel Bandwidth) & 99% Bandwidth

Test setup



Limit

According to §15.247(a)(2), Systems using digital modulation techniques may operate in the 902–928 MHz, 2 400–2 483.5 MHz, and 5 725–5 850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Test procedure

ANSI C63.10 - Section 11.8.2

Test settings

DTS bandwidth



One of the following procedures may be used to determine the modulated DTS bandwidth.

Option 1

- 1) Set RBW = 100 kHz.
- 2) Set the video bandwidth (VBW) $\geq 3 \times$ RBW.
- 3) Detector = Peak.
- 4) Trace mode = max hold.
- 5) Sweep = auto couple.
- 6) Allow the trace to stabilize.
- 7) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Option 2

The automatic bandwidth measurement capability of an instrument may be employed using the X dB bandwidth mode with X set to 6 dB, if the functionality described in 11.8.1 (i.e., RBW = 100 kHz, VBW $\geq 3 \times$ RBW, and peak detector with maximum hold) is implemented by the instrumentation function. When using this capability, care shall be taken so that the bandwidth measurement is not influenced by any intermediate power nulls in the fundamental emission that might be ≥ 6 dB.

<p>Eurofins KCTL Co.,Ltd. 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-5008-1021 FAX: 82-505-299-8311 www.kctl.co.kr</p>	<p>Report No.: KR23-SRF0173-B Page (30) of (133)</p>	 
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Occupied bandwidth (or 99% emission bandwidth)

- ◆ The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- ◆ The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emissions skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g. on adjacent channels) within the span.
- ◆ The detector of the spectrum analyzer shall be set to “Sample”. However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or “Max hold”) may be necessary to determine the occupied / x dB bandwidth if the device is not transmitting continuously.
- ◆ The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted

Notes: it may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms, the recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).

Test results

SISO

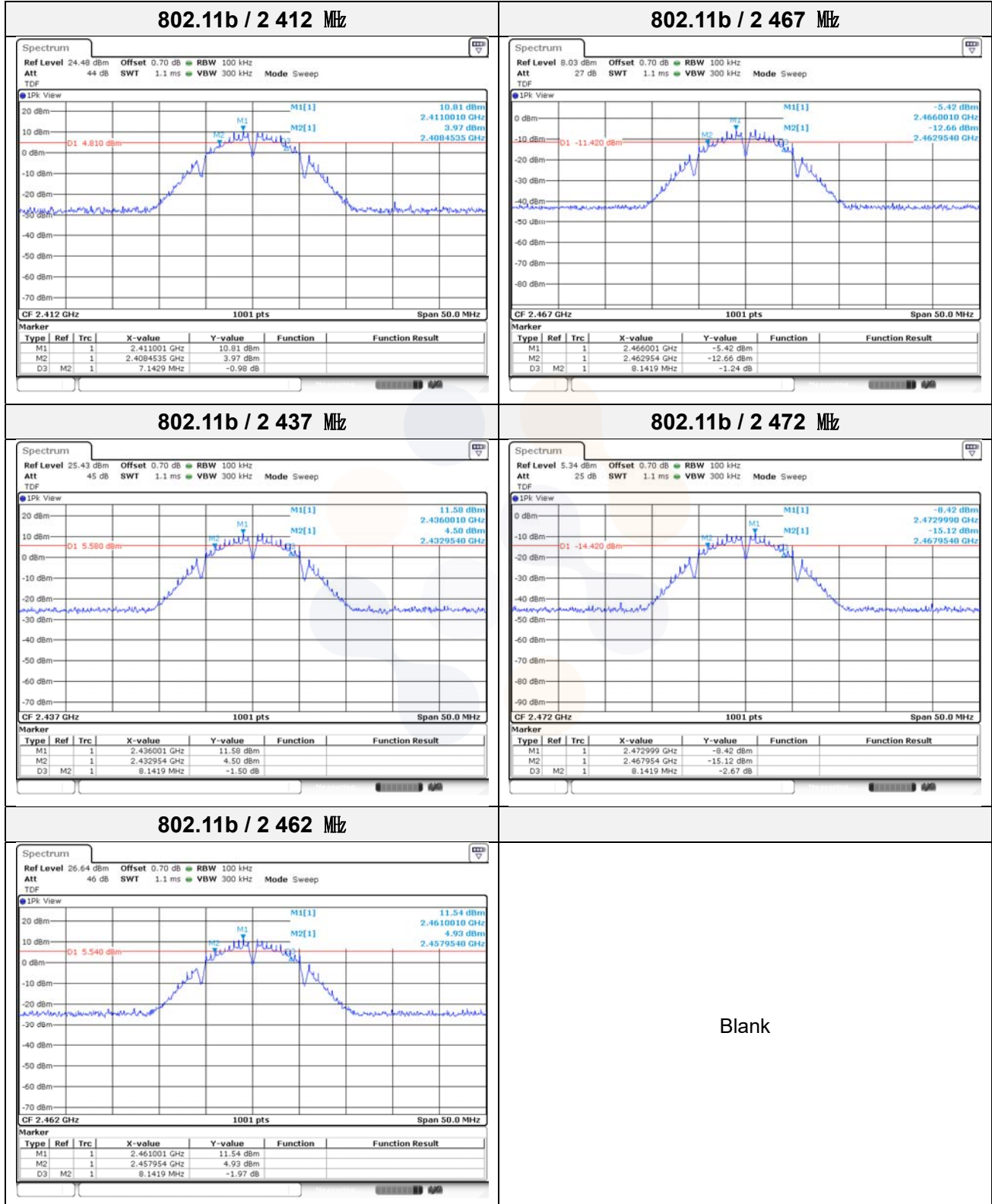
Test mode	Frequency(MHz)	6 dB bandwidth(MHz)	99% Bandwidth(MHz)
		ANT 1	ANT 1
802.11b	2 412	7.14	14.09
	2 437	8.14	14.09
	2 462	8.14	14.19
	2 467	8.14	13.89
	2 472	8.14	14.04
802.11g	2 412	16.38	16.48
	2 437	16.38	16.48
	2 462	16.38	16.53
	2 467	16.08	16.43
	2 472	16.03	16.48
802.11n HT20	2 412	16.93	17.58
	2 437	16.88	17.63
	2 462	16.98	17.58
	2 467	16.98	17.58
	2 472	16.18	17.63

MIMO

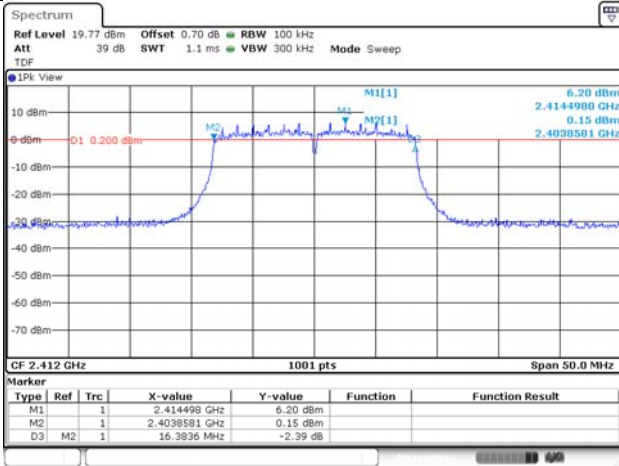
Test mode	Frequency(MHz)	6 dB bandwidth(MHz)		99% Bandwidth(MHz)	
		ANT 1	ANT 2	ANT 1	ANT 2
802.11b	2 412	7.64	7.19	14.09	14.34
	2 437	7.64	8.14	14.14	14.14
	2 462	7.14	8.19	14.19	13.79
	2 467	7.64	8.14	13.94	13.89
	2 472	7.14	7.59	14.04	14.04
802.11g	2 412	16.08	16.43	16.48	16.38
	2 437	16.38	16.43	16.53	16.43
	2 462	16.38	16.38	16.48	16.43
	2 467	16.08	16.38	16.43	16.43
	2 472	15.83	15.83	16.48	16.43
802.11n HT20	2 412	17.03	16.63	17.58	17.58
	2 437	16.98	16.88	17.63	17.58
	2 462	16.88	16.88	17.58	17.53
	2 467	16.88	16.58	17.58	17.53
	2 472	16.98	16.18	17.63	17.58

SISO

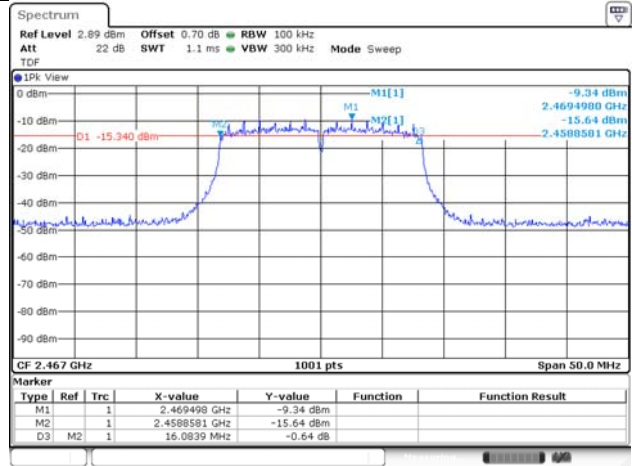
6 dB bandwidth



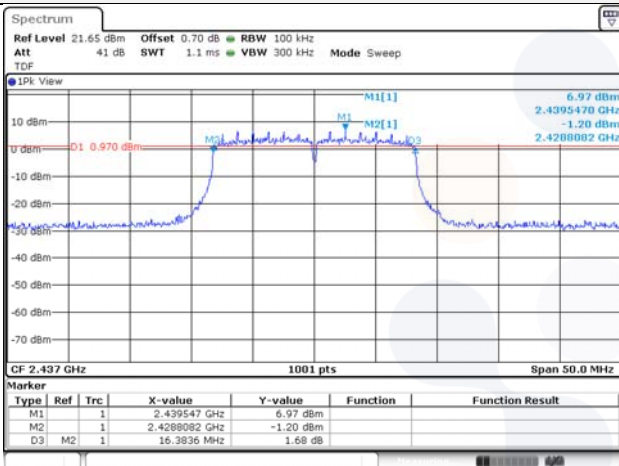
802.11g / 2 412 MHz



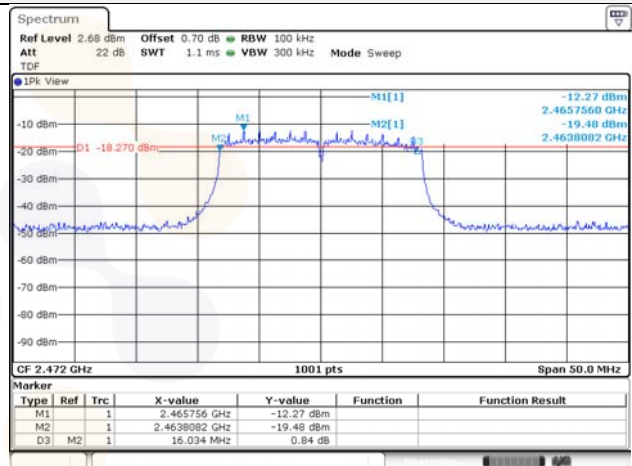
802.11g / 2 467 MHz



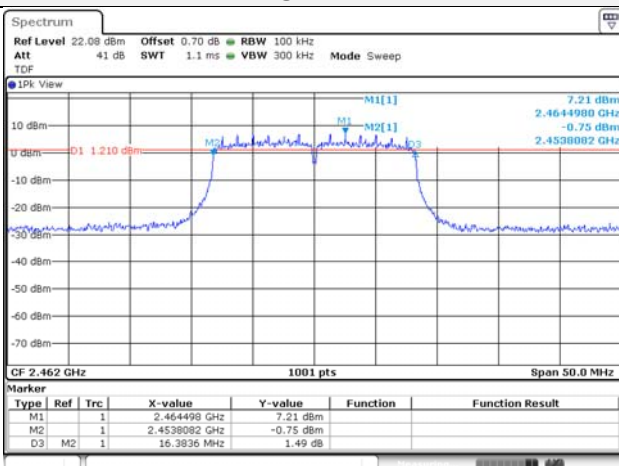
802.11g / 2 437 MHz



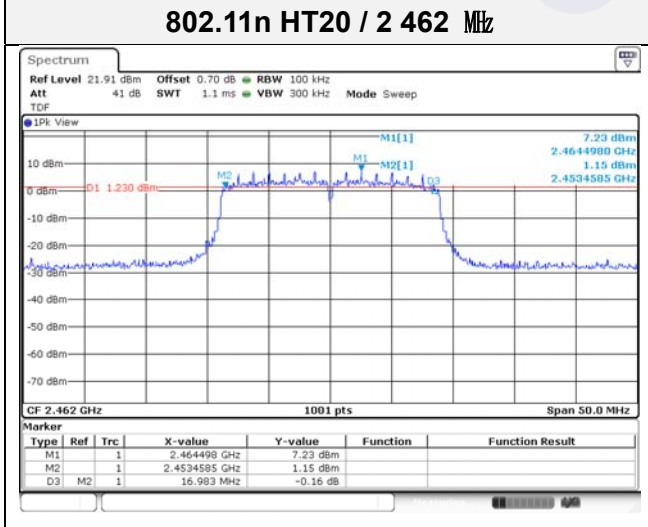
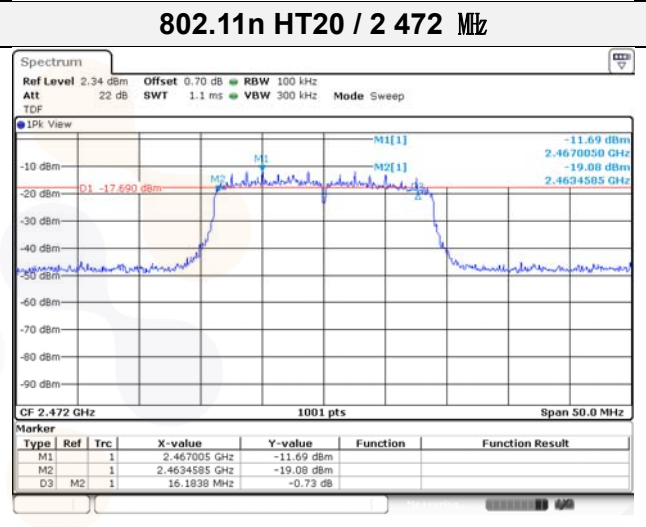
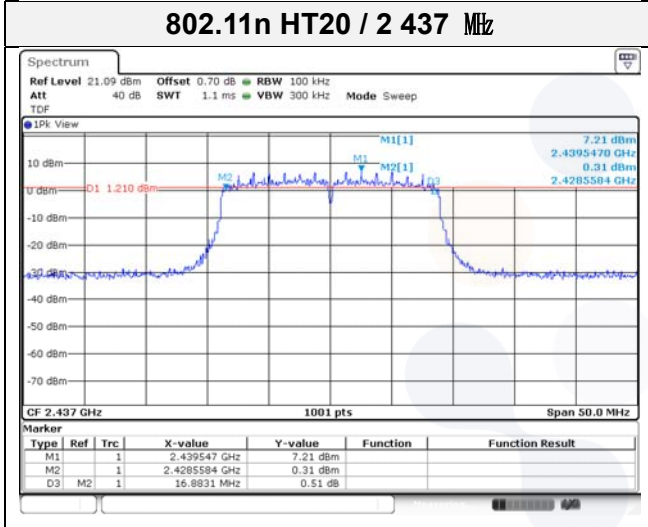
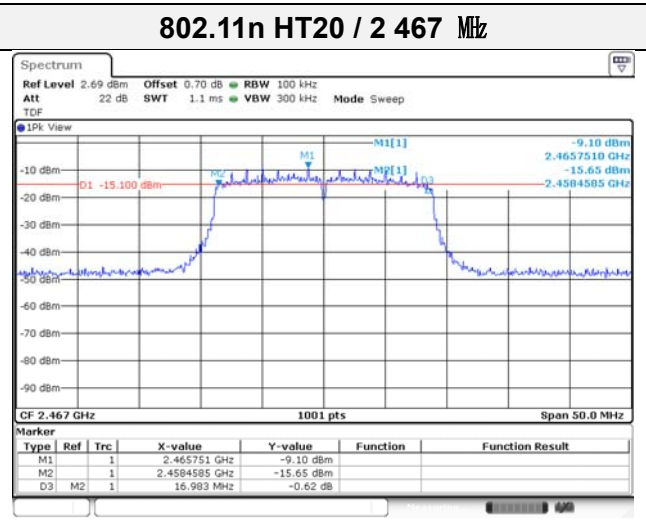
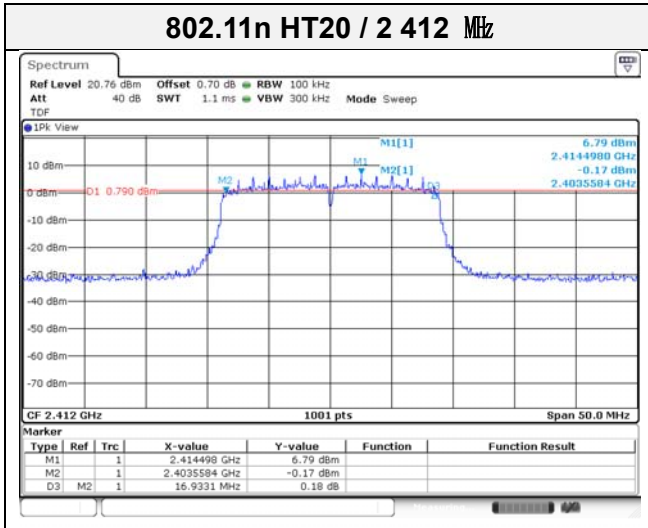
802.11g / 2 472 MHz



802.11g / 2 462 MHz

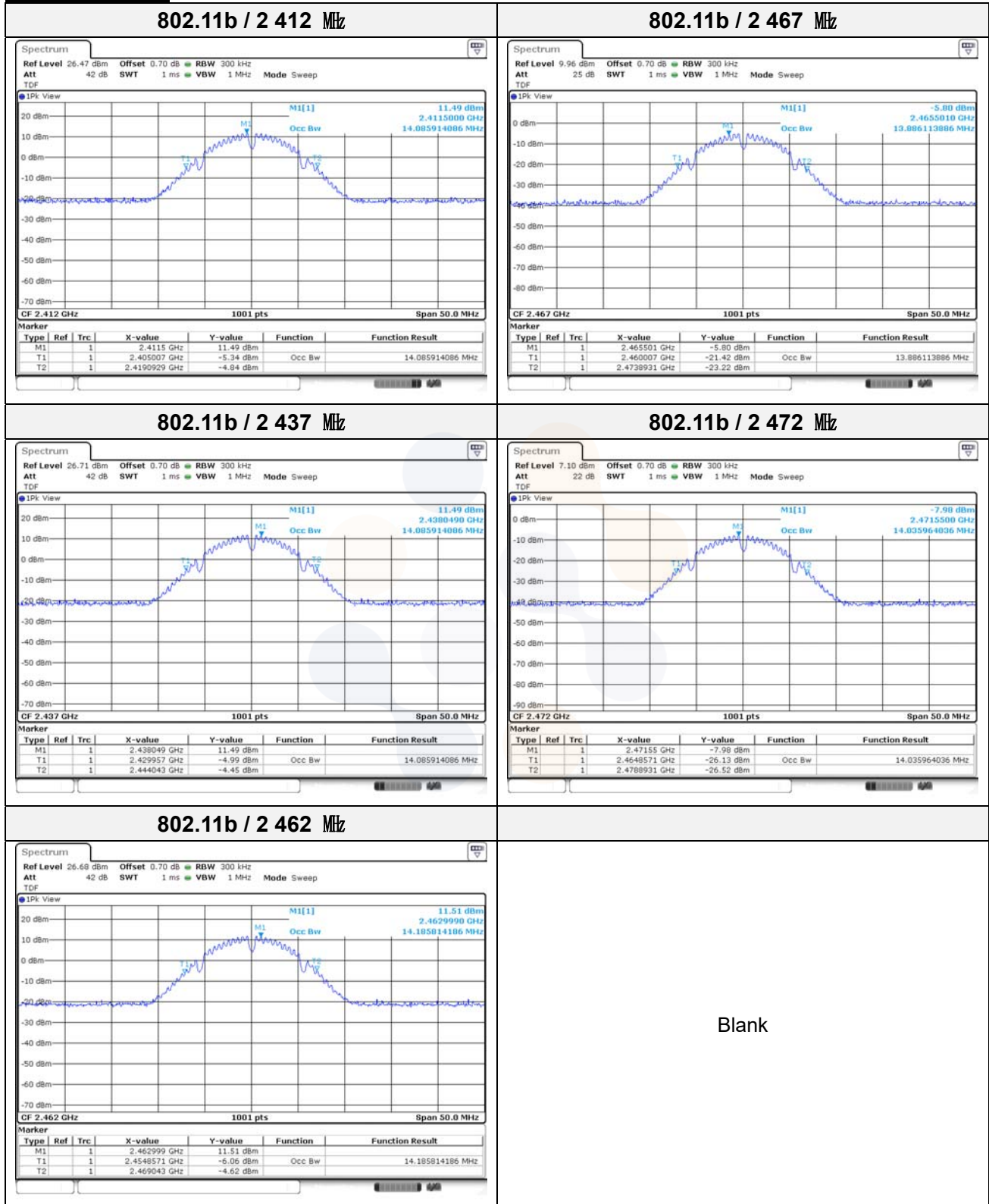


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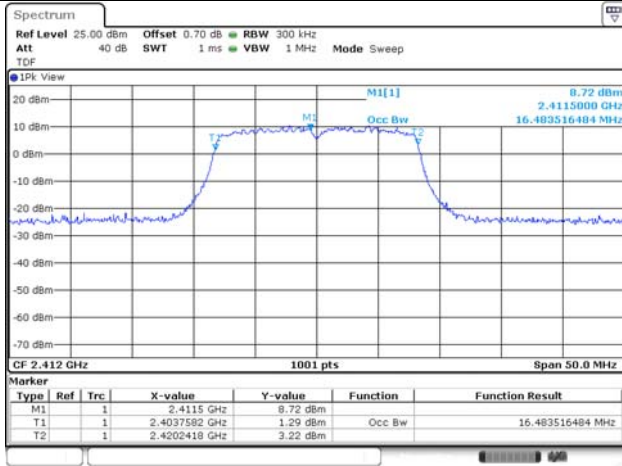
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99% Bandwidth

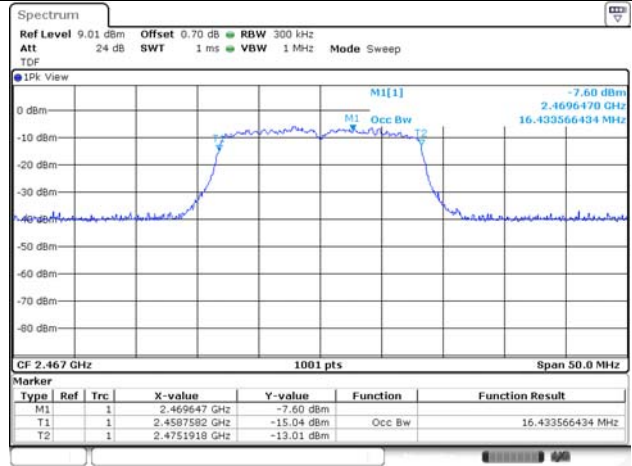


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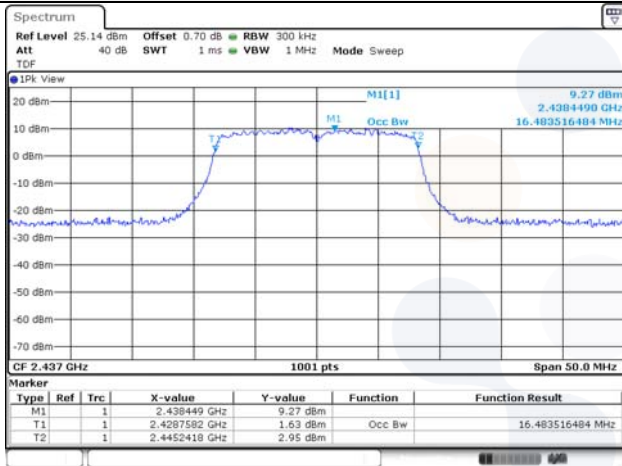
802.11g / 2 412 MHz



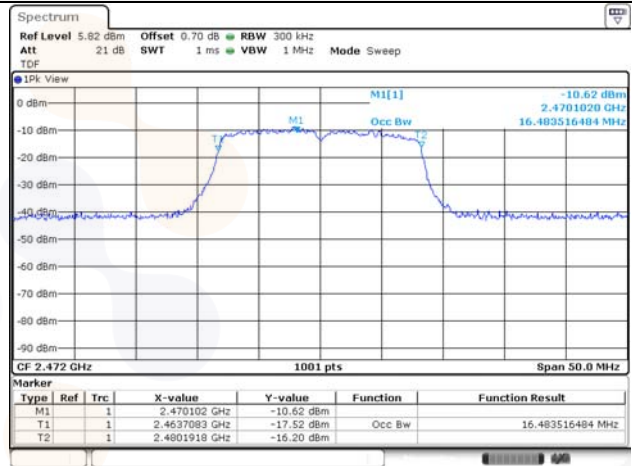
802.11g / 2 467 MHz



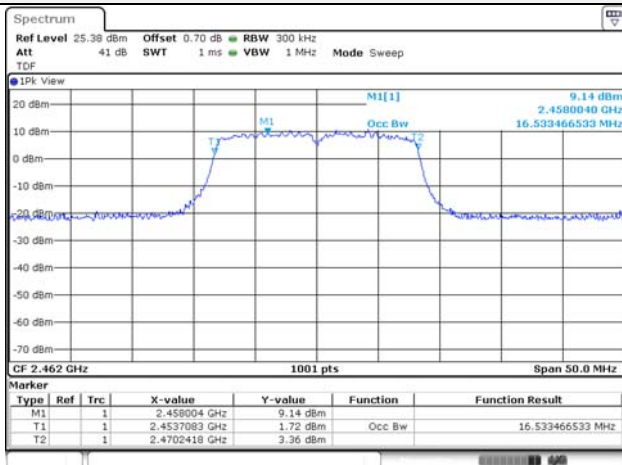
802.11g / 2 437 MHz



802.11g / 2 472 MHz

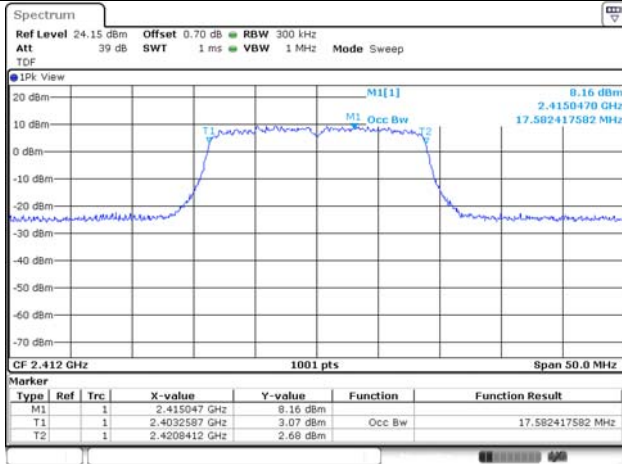


802.11g / 2 462 MHz

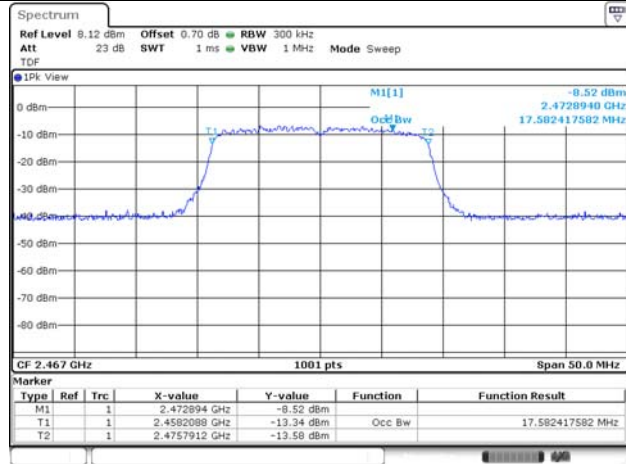


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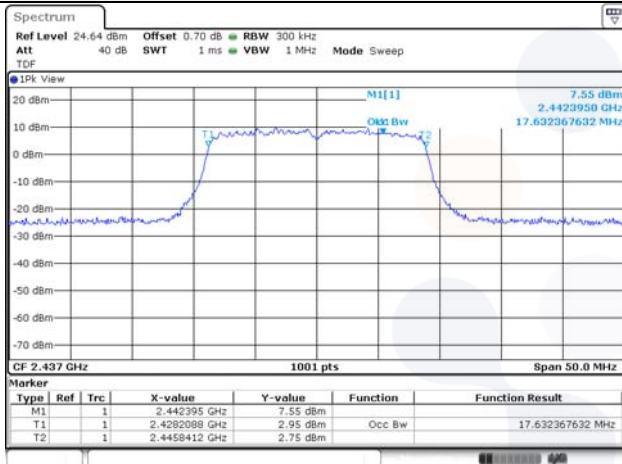
802.11n HT20 / 2 412 MHz



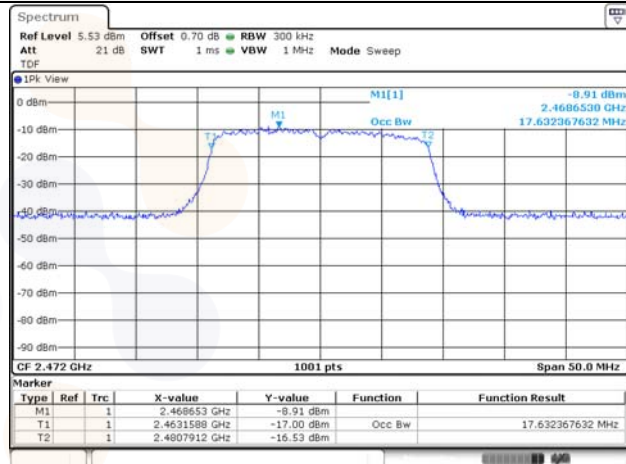
802.11n HT20 / 2 467 MHz



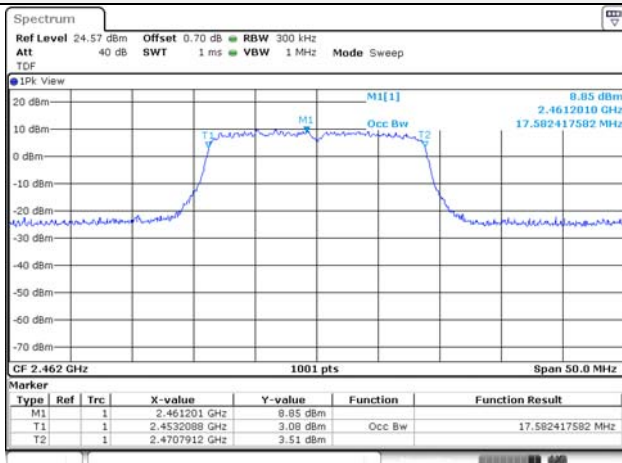
802.11n HT20 / 2 437 MHz



802.11n HT20 / 2 472 MHz



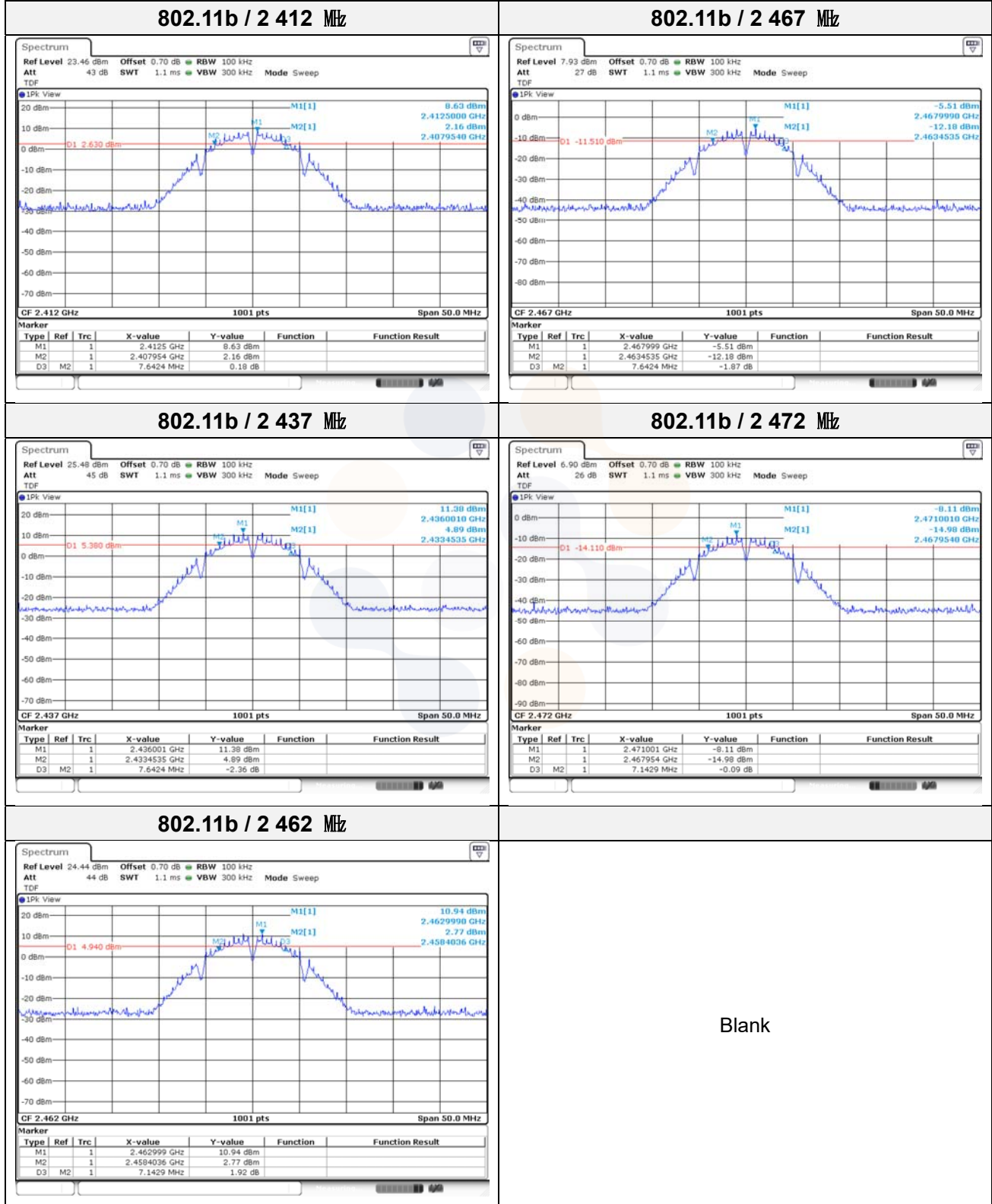
802.11n HT20 / 2 462 MHz



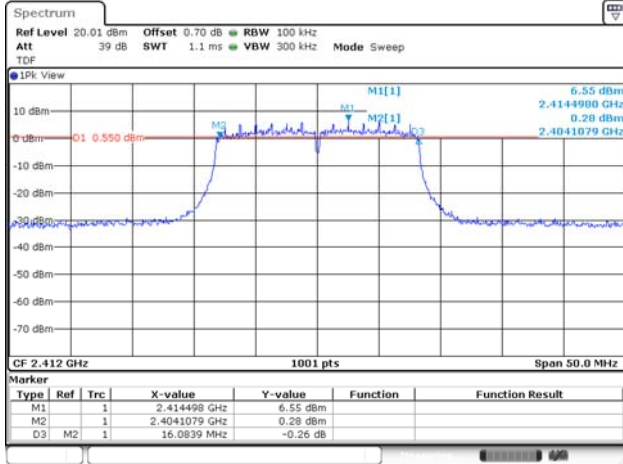
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MIMO ANT 1

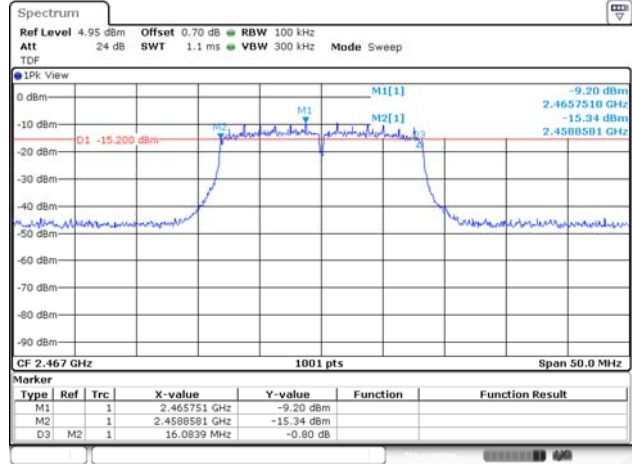
6 dB bandwidth



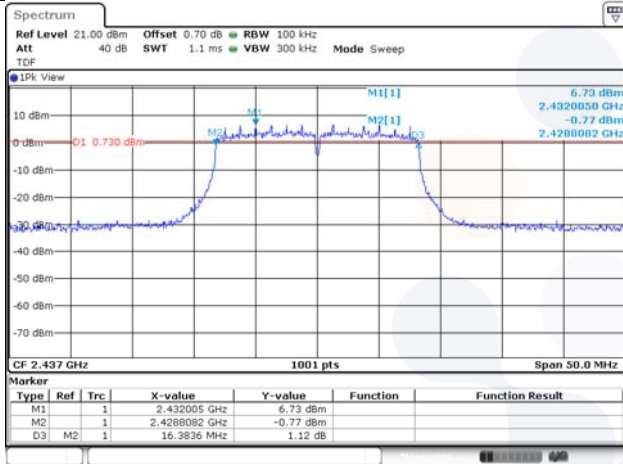
802.11g / 2 412 MHz



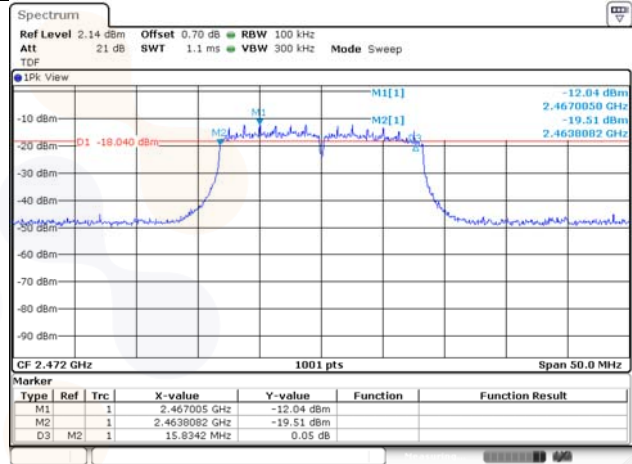
802.11g / 2 467 MHz



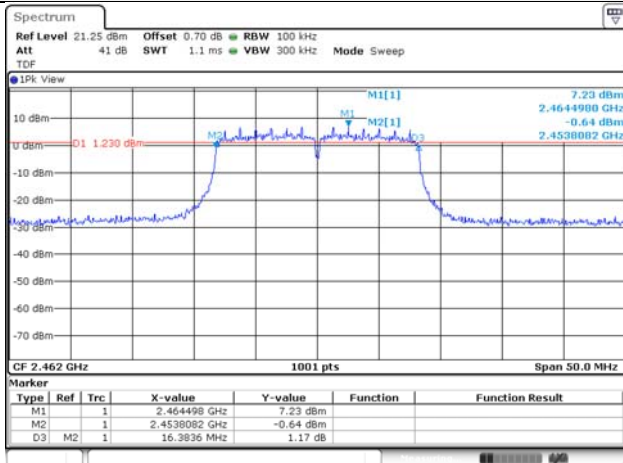
802.11g / 2 437 MHz



802.11g / 2 472 MHz

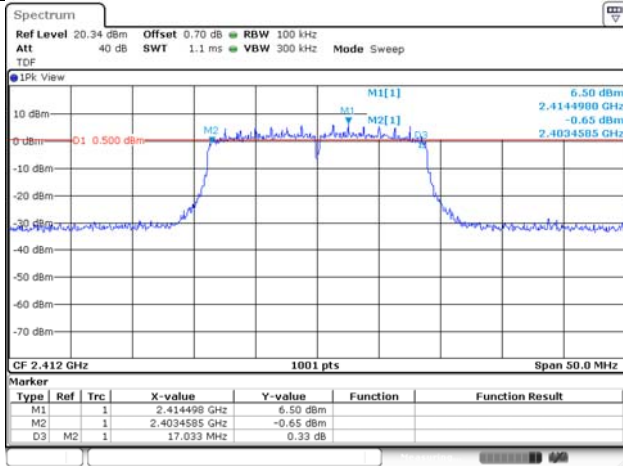


802.11g / 2 462 MHz

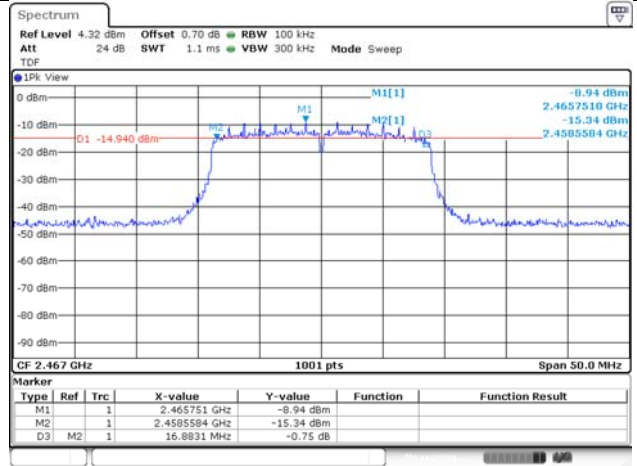


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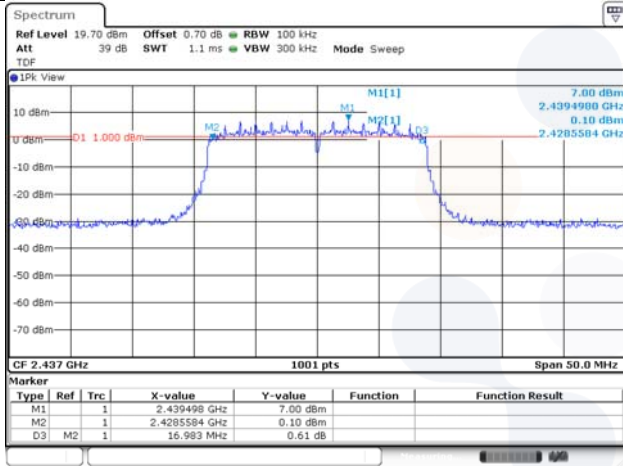
802.11n HT20 / 2 412 MHz



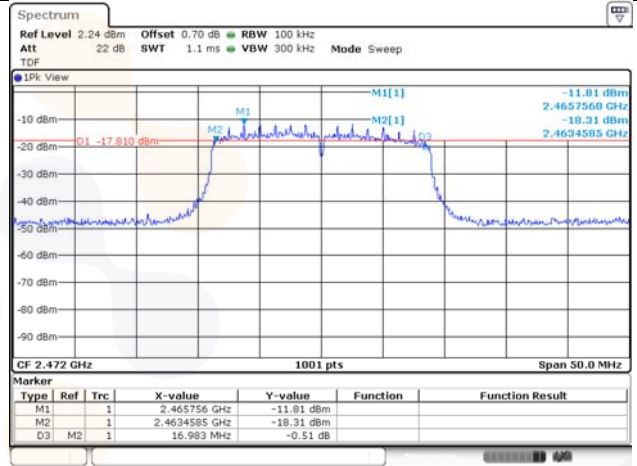
802.11n HT20 / 2 467 MHz



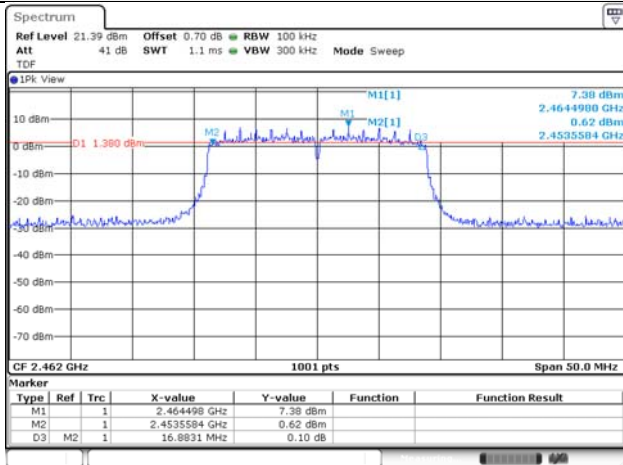
802.11n HT20 / 2 437 MHz



802.11n HT20 / 2 472 MHz

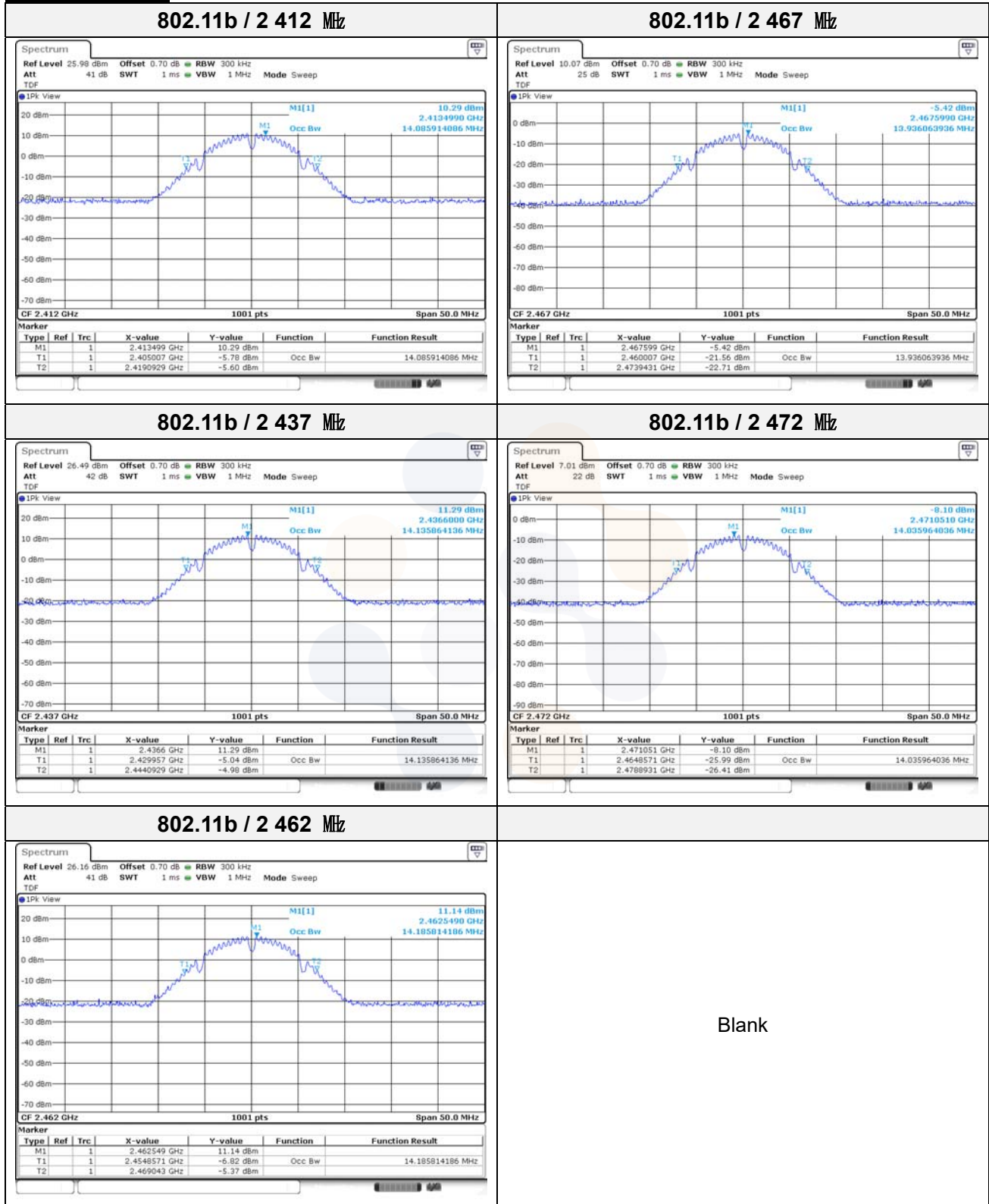


802.11n HT20 / 2 462 MHz

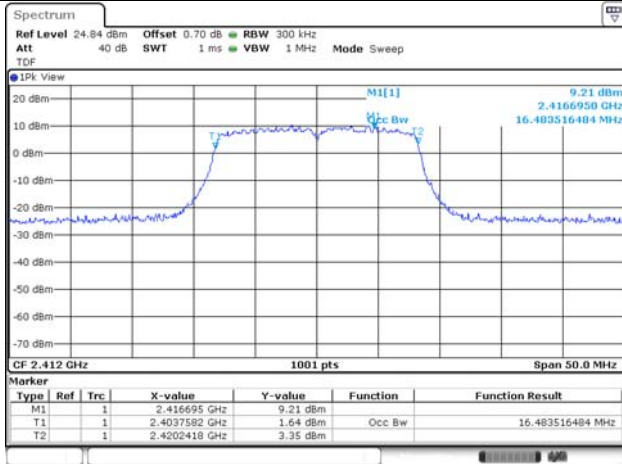


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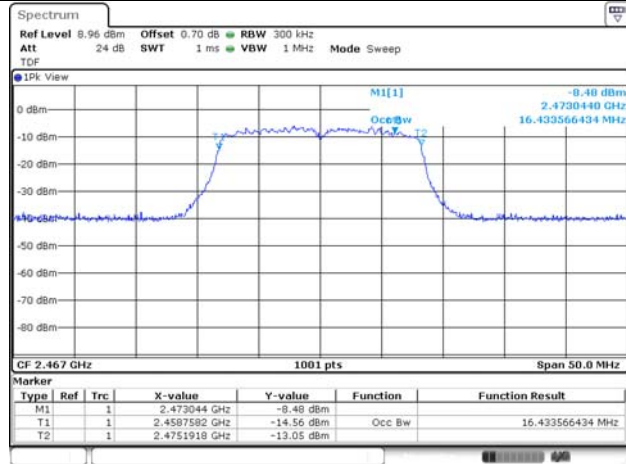
99% Bandwidth



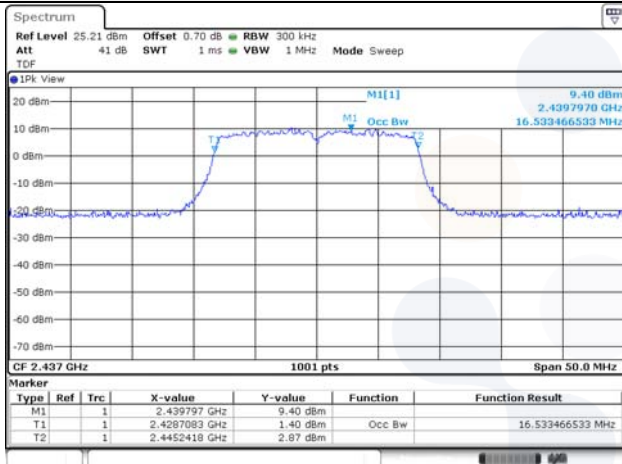
802.11g / 2 412 MHz



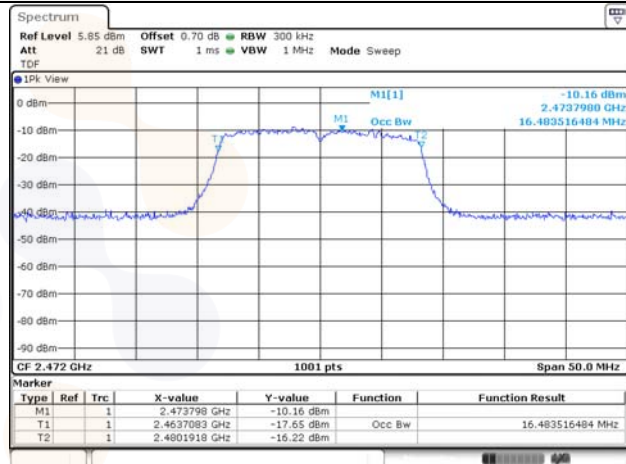
802.11g / 2 467 MHz



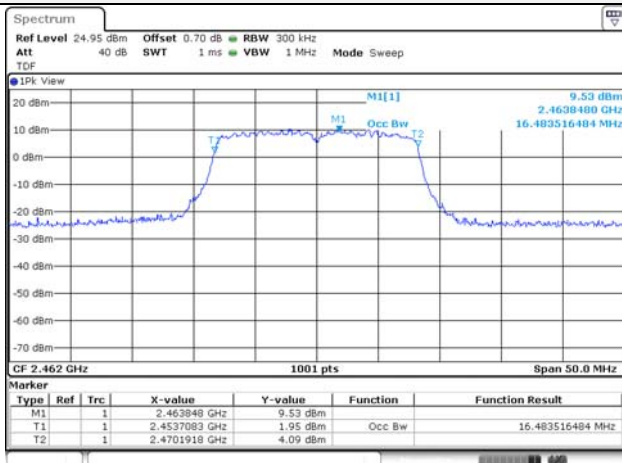
802.11g / 2 437 MHz



802.11g / 2 472 MHz

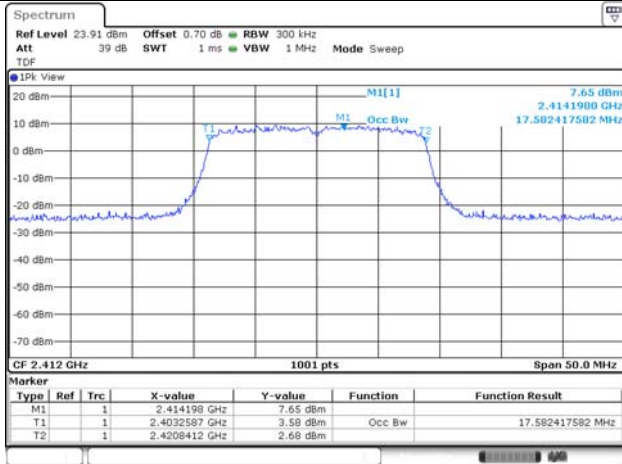


802.11g / 2 462 MHz

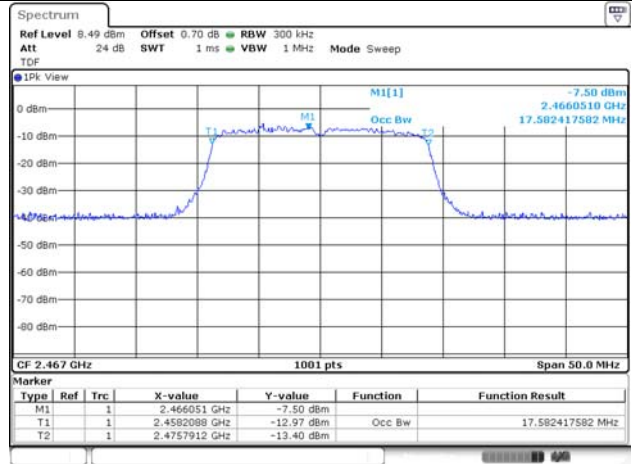


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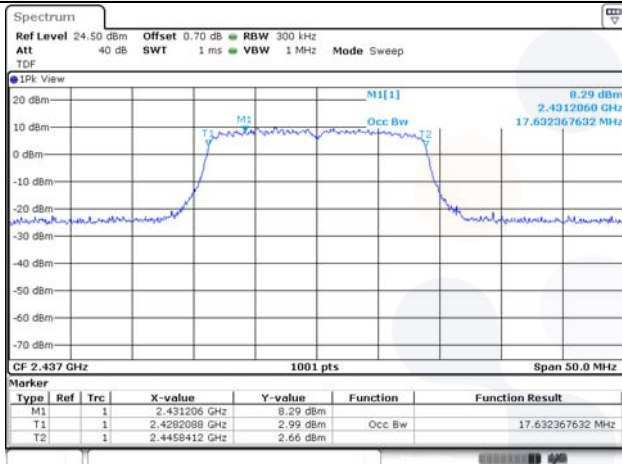
802.11n HT20 / 2 412 MHz



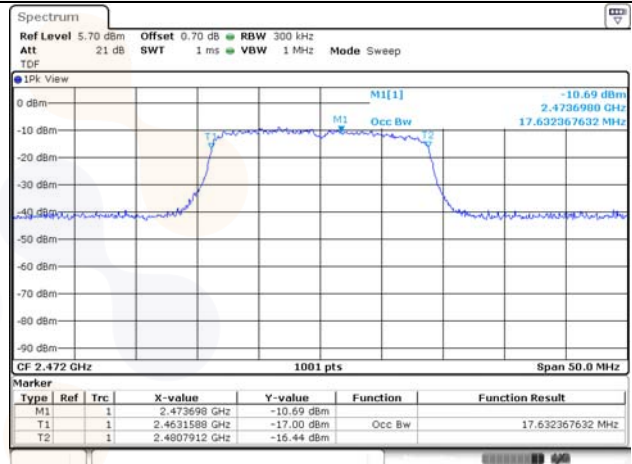
802.11n HT20 / 2 467 MHz



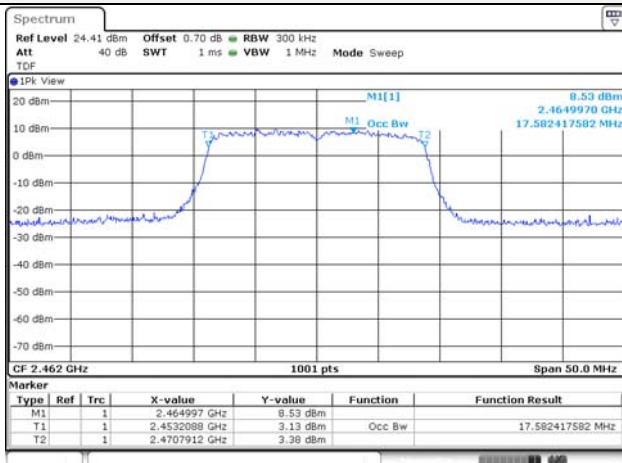
802.11n HT20 / 2 437 MHz



802.11n HT20 / 2 472 MHz



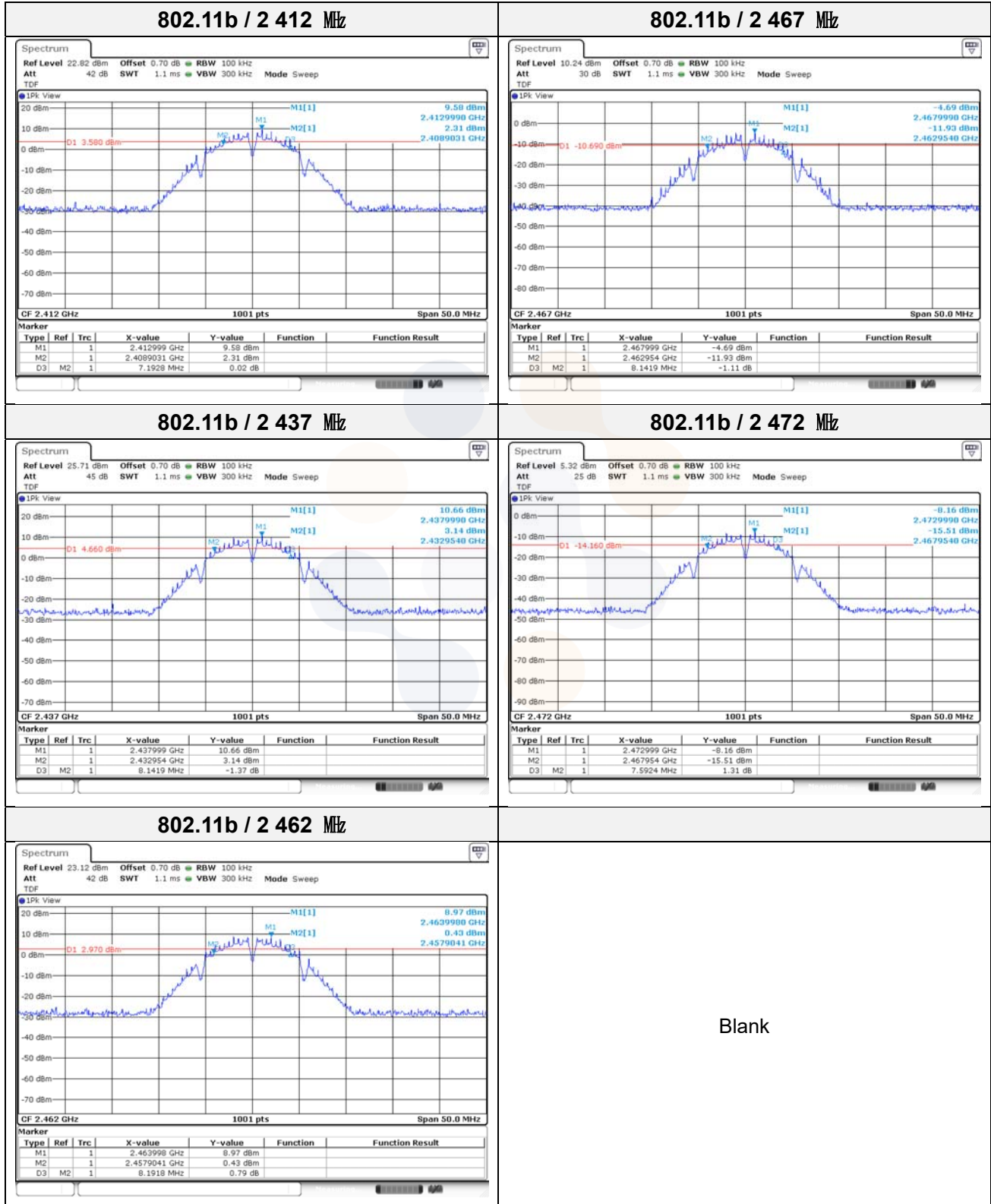
802.11n HT20 / 2 462 MHz



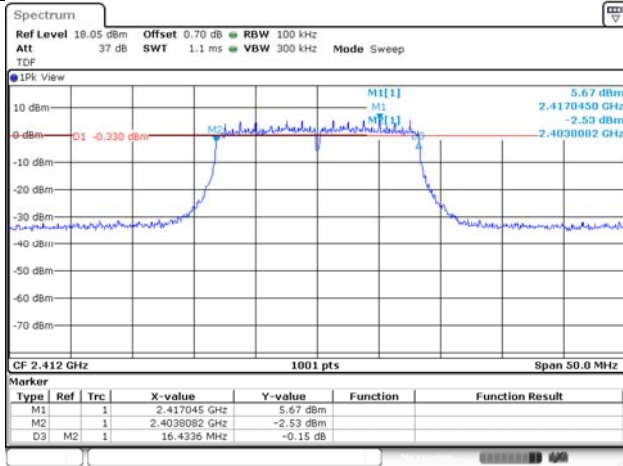
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MIMO ANT 2

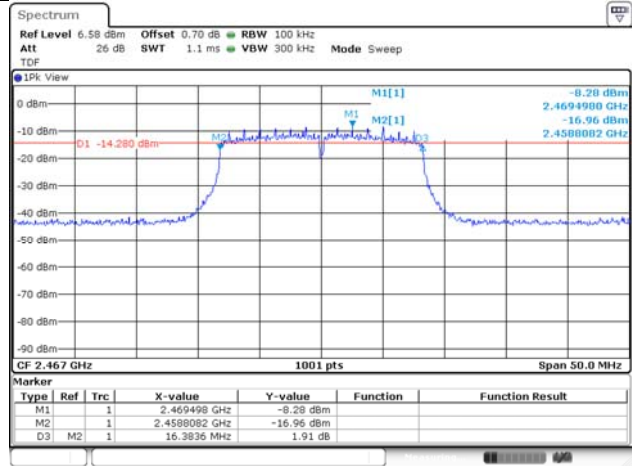
6 dB bandwidth



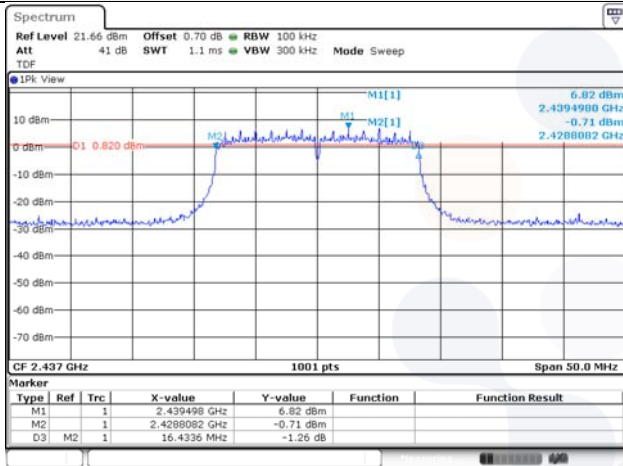
802.11g / 2 412 MHz



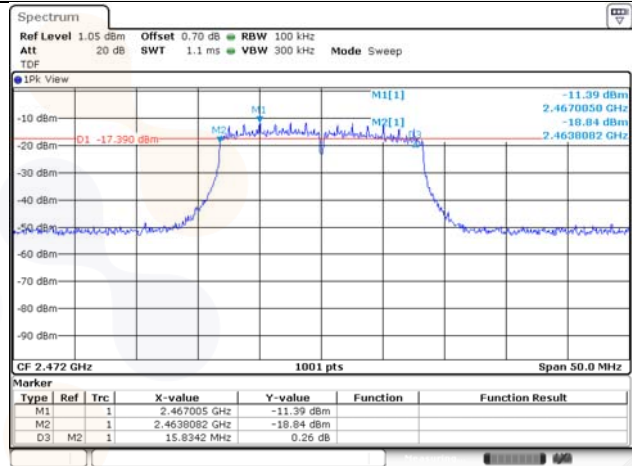
802.11g / 2 467 MHz



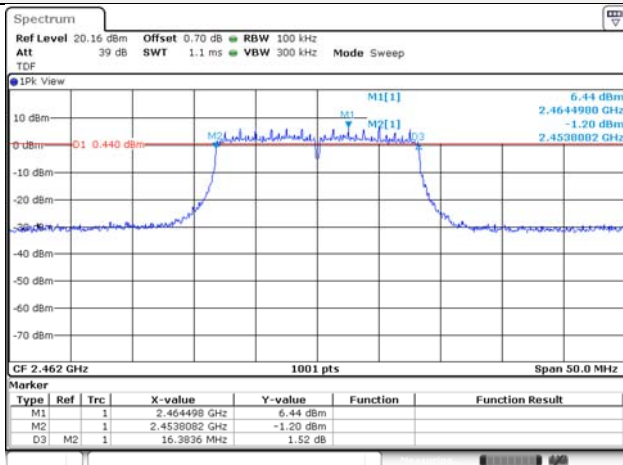
802.11g / 2 437 MHz



802.11g / 2 472 MHz

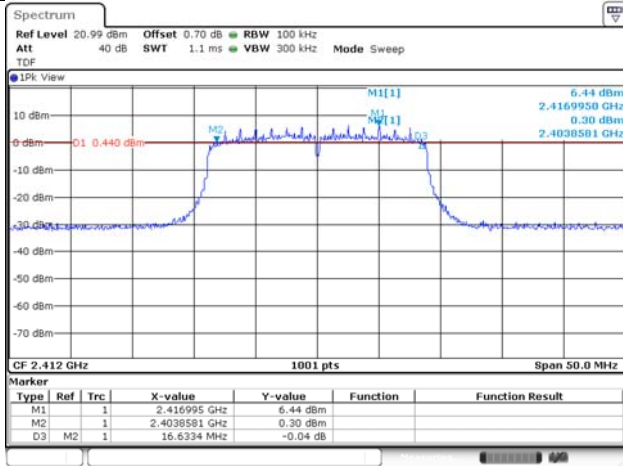


802.11g / 2 462 MHz

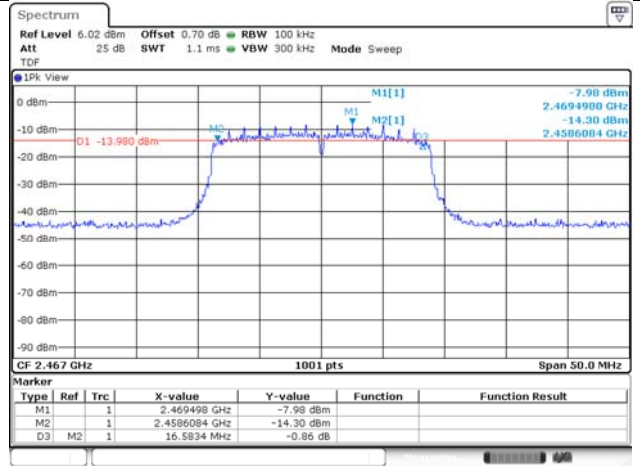


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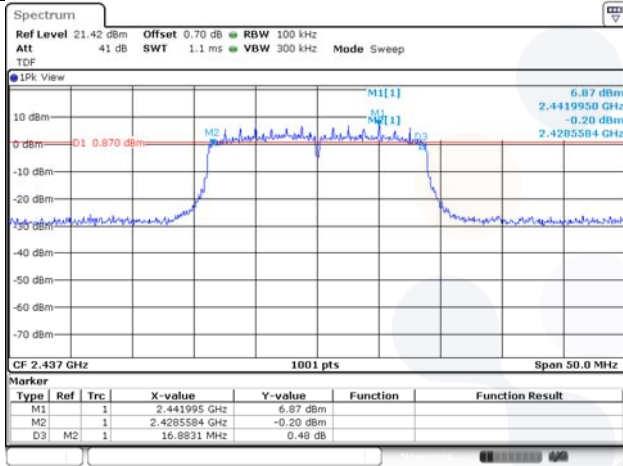
802.11n HT20 / 2 412 MHz



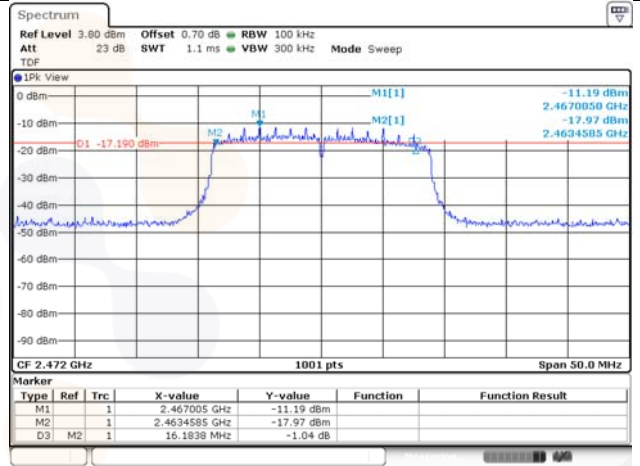
802.11n HT20 / 2 467 MHz



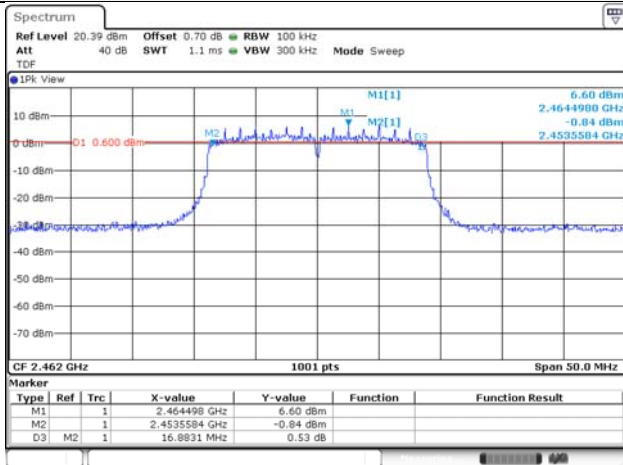
802.11n HT20 / 2 437 MHz



802.11n HT20 / 2 472 MHz

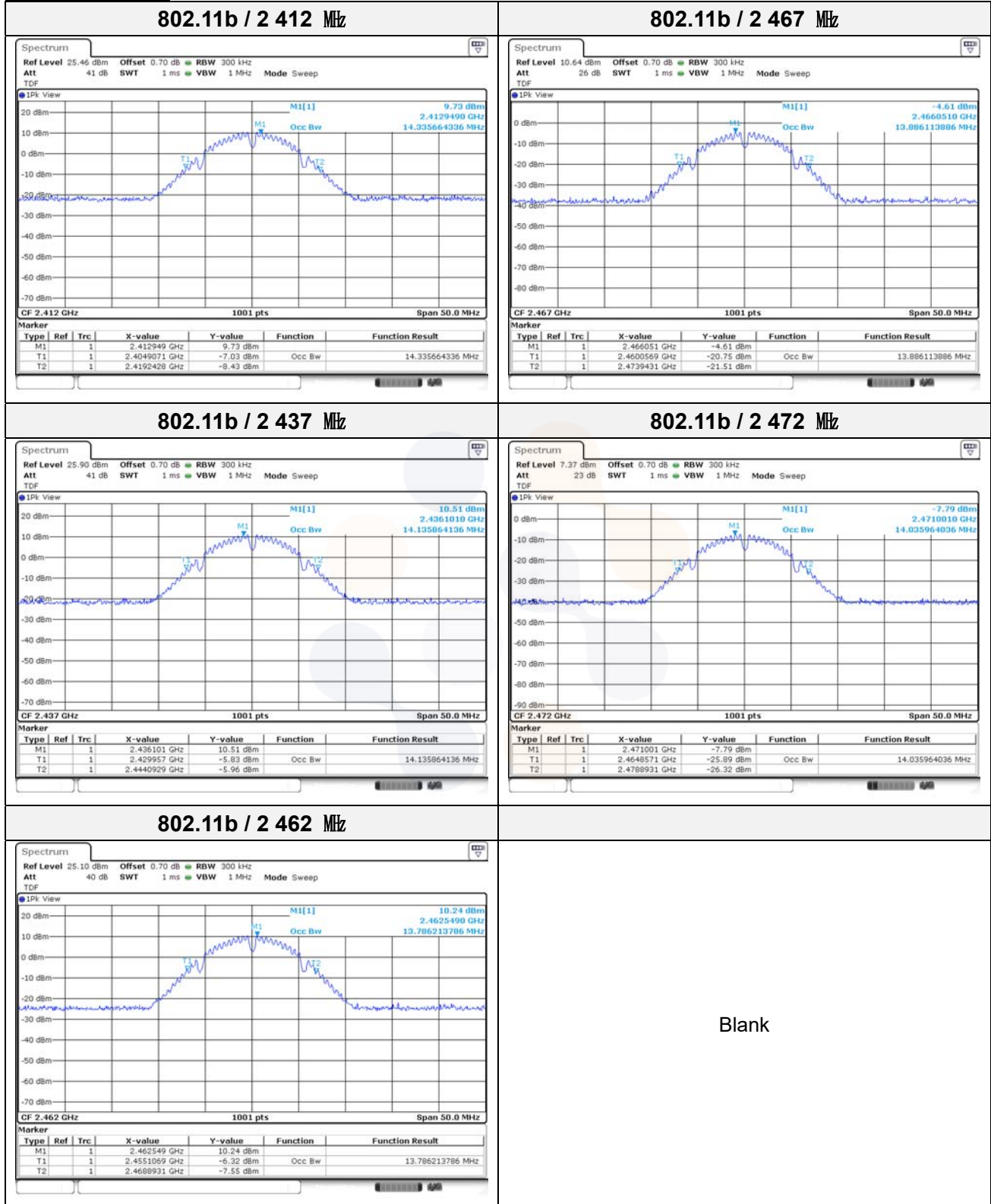


802.11n HT20 / 2 462 MHz

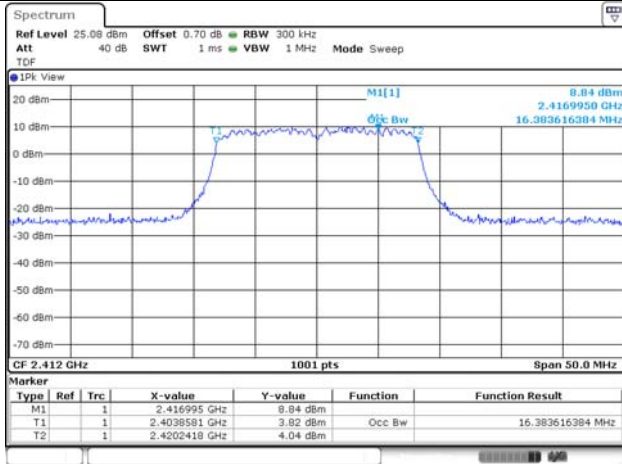


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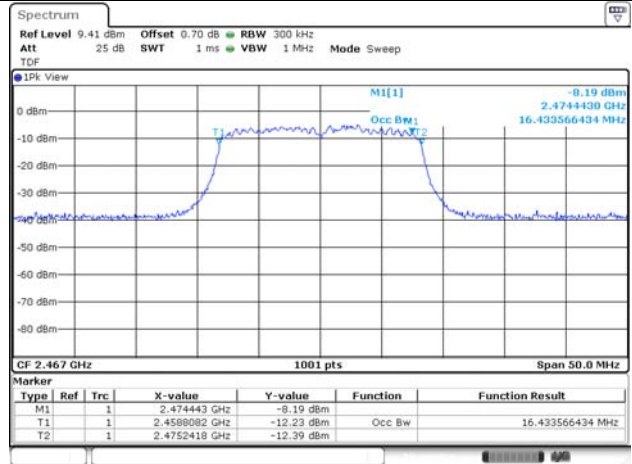
99% Bandwidth



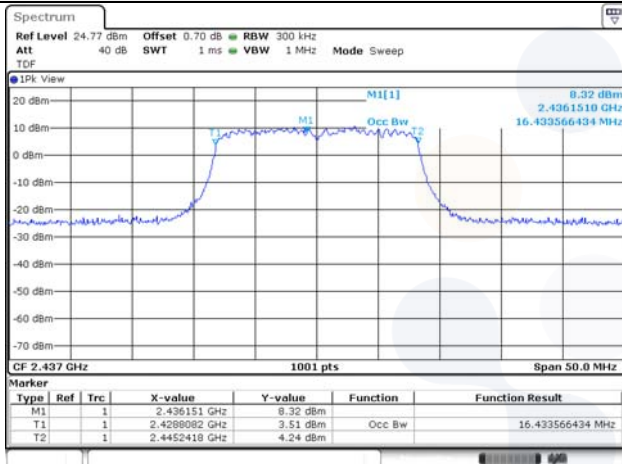
802.11g / 2 412 MHz



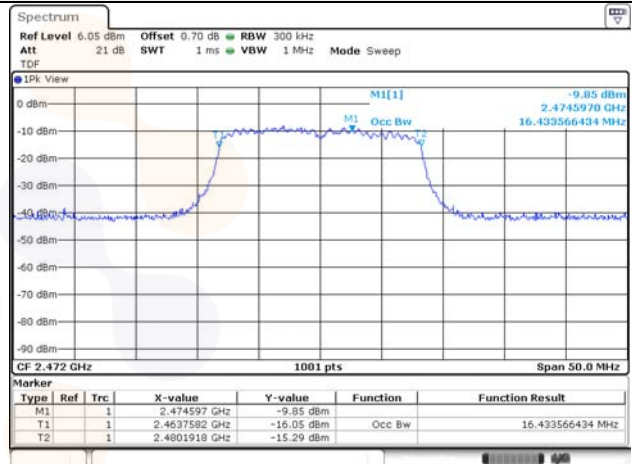
802.11g / 2 467 MHz



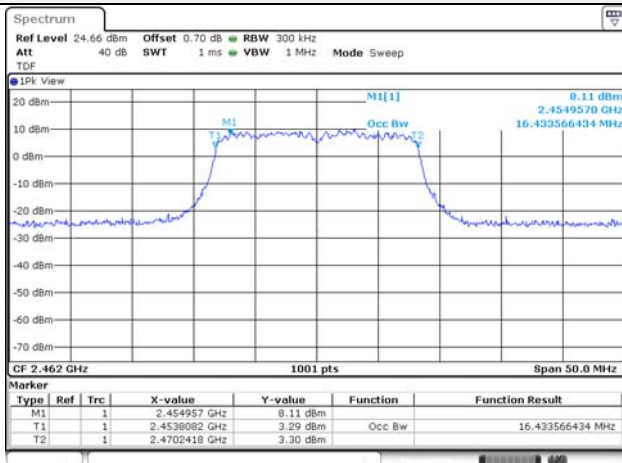
802.11g / 2 437 MHz



802.11g / 2 472 MHz

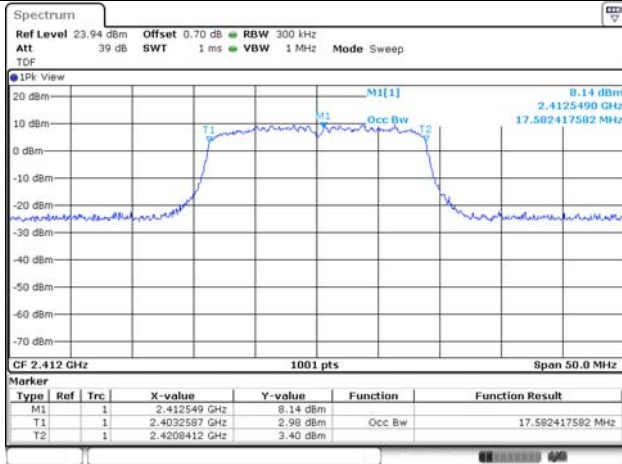


802.11g / 2 462 MHz

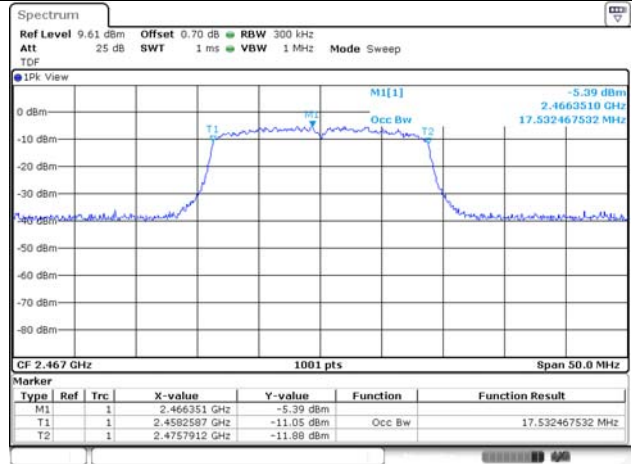


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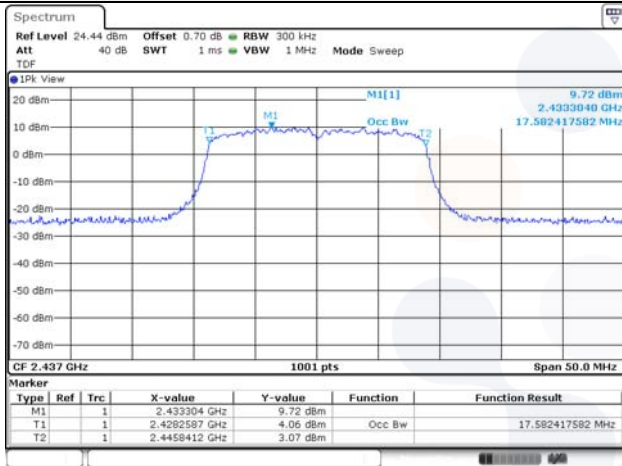
802.11n HT20 / 2 412 MHz



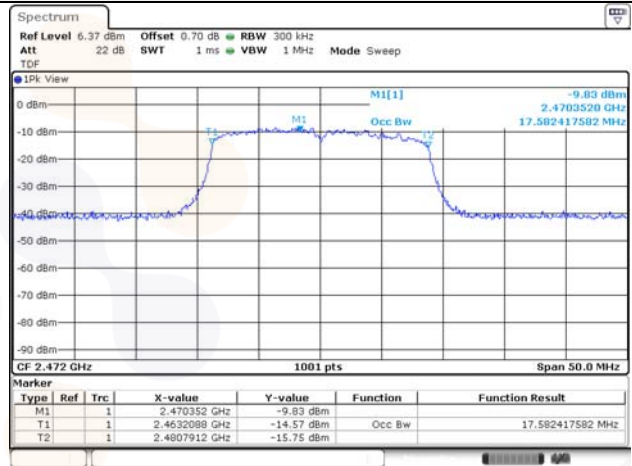
802.11n HT20 / 2 467 MHz



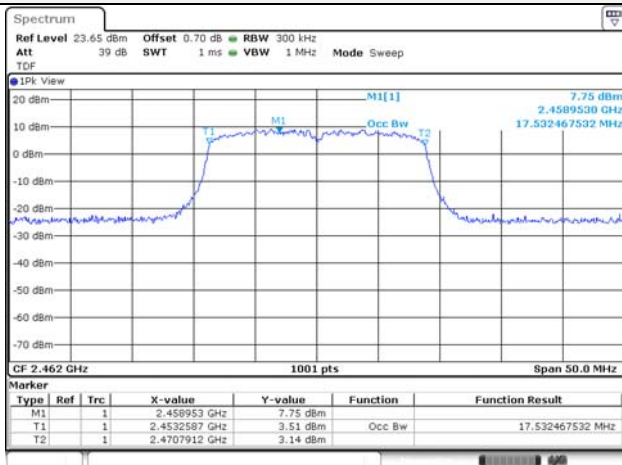
802.11n HT20 / 2 437 MHz



802.11n HT20 / 2 472 MHz



802.11n HT20 / 2 462 MHz



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